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AN ILLUSTRATED MAGAZINE

OF

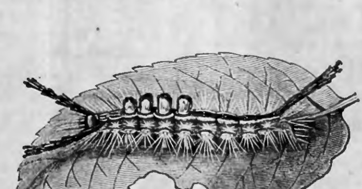
POPULAR AND PRACTICAL

ENTOMOLOGY AND BOTANY.

EDITED BY

CHARLES V. RILEY AND DR. GEORGE VASEY.

VOL. II.



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1870.

INDEX.

D

E

F

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H

ERRATA.

Page 5, col. 1, line 11, omit the second "of." Page 6, col. 1, line 2, for ? read ! Page 8, col. 1, line 1, for "thirty" read "twenty." Page 27, col. 2, line 13 from bottom, for "Gold Gilt-beetle" read "Gilt Gold-beetle." Page 31, col. 1, line 30, for "*Culopteron*" read "*Calopteron.*" Page 31, col. 1, line 41, for "No. 8 pin" read "No. 18 pin." Page 32, col. 2, line 10, for "*Gasteracautha*" read "*Gasteracantha.*" Page 45, col. 1, line 17 from bottom, for "35" read "47;" line 12 from bottom, for "33" read "45," and for "34" read "46." Page 85, col. 1, line 23, for "last" read "this." Page 97, over the illustration, for "Fig. 59" read "Fig. 59½." Page 101, col. 2, line 25, for "*Cecropia*" read "*Cecropiæ*;" same column, note, for "*Chalcis maria*" read "*Chalcis mariæ.*" Page 111, col. 1, line 2 from bottom, for "*Peiris*" read "*Pieris.*" Page 131, col. 1, line 10 from bottom, for "oval" read "oblong-oval." Page 152, col. 1, line 21, for "one" read "our." Page 163, col. 2, line 6, for "results" read "result." Page 168, col. 1, lines 15 from top and 6 from bottom, for "*Alanda*" read "*Alauda.*" Page 159, col. 2, line 13, for "S. C." read "C. W." Page 183, col. 2, line 21 from bottom, for "Fig. 113" read "Fig. 115." Page 188, col. 1, line 16, for "*Cersis*" read "*Cercis.*" Page 211, col. 1, line 20 from bottom, for "as" read "and." Page 244, col. 2, line 24, for "(*C. thyoides*)" read "(*C. disticha*, Linn.)" Page 271, col. 1, line 3 from bottom, add a comma after "left." Page 276, col. 1, line 8 from bottom, for "*quinquemacalata*" read "*quinquemaculata*;" same page, col. 2. line 16 from bottom, for "Shaffer" read "Saffer." Page 302, col. 2, line 25 from bottom, for "in" read "and." Page 339, col. 1, line 22 from bottom, for "*Colandra*" read "*Calandra.*" On page 126, note, we referred all the drawings of Figure 85 to *Bruchus granarius:* in reality *a*, *e* and *f* only, represent that species, while *b*, *c*, *d* and *g* represent *Bruchus pisi.*

INDEX TO BOTANICAL DEPARTMENT.

T. GLOVER.

THE

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WHY NOXIOUS INSECTS INCREASE UPON US.

It is an old and a very true remark, that the various insects that afflict the Gardener and the Fruit-grower are year by year becoming more numerous and more destructive. One principal reason for this result is sufficiently obvious. The continual tendency of modern improvement is to concentrate vegetable gardens and fruit farms in certain peculiarly favorable localities, instead of scattering them evenly and uniformly over the whole country. Hence every injurious insect that troubles the Gardener and the Fruit-grower has an abundant supply of such vegetation, as forms a suitable nidus for its future offspring, close at hand, instead of having to search for it with much labor over an extensive surface of country. Such insects are therefore enabled by this means to increase and multiply with greater ease and greater rapidity. Upon precisely the same principle, if you scatter over the surface of a whole county the amount of shelled corn that is just sufficient to feed a certain gang of hogs, and compel them to seek it out and pick it up every day of the year, they will not thrive so well nor multiply so fast, as if you feed out the very same amount of corn to them in a ten-acre lot, day after day for a whole year.

To a gentleman in Arkansas, who had expressed the opinion that that State was the best in the Union for the peach and the grape, and that Illinois was not naturally adapted to the culture of fruit, Dr. E. S. Hull recently replied in the following masterly manner. We copy from the *Journal of Agriculture* for August 14, 1869:

SIR—Your confidence in the superior adaptability of your soil and climate will probably not be maintained after a few years' experience. Just in proportion as you increase improved fruits, just in that proportion will fruit insects and fruit and fruit tree diseases increase with you. A recognition of this fact will each year, as you multiply your orchards, become more and more apparent. Your Hale's Early peaches, at first, will be free from rot, your pear trees measurably exempt from pear tree blight, your vines free from vine hoppers, the grapes free from grape codlings and rot, etc., etc. From some cause, not yet well understood, all or nearly all young vineyards are for the first few years of fruitage, free from rot, and then ever afterwards subject to it. The same is true of cherry, peach, and plum rot. Therefore to those engaging in horticultural pursuits, a knowledge of the several difficulties likely to be encountered should be recognized, and so far as known the remedies for each difficulty must be promptly applied.

In this State, or in certain portions of it, many persons believe that horticulture is undergoing a great revolution, and ultimately that the business will be mainly in the hands only of the well-informed — those who understand and promptly apply the proper means. In view of known facts and observations, made during the past twenty-three years in this part of the West, and further South, I am convinced that all sections alike must recognize as facts these statements.

Here the matter seems to have dropped. Nobody has thought of accusing Dr. Hull of being an atheist and a blasphemer, because he has said that the more you multiply your orchards, and the more you increase improved fruits, the more will bugs and other kinds of destructive organisms multiply and increase upon you. Nobody, in fact, has even gone so far as to insinuate that, simply because he has written the letter which we have printed above, he leans towards Socinianism, or Arianism, or Erastianism, or any of the other fine shades of *ism*, whereby heterodoxy (whatever that may be) differs from orthodoxy.

Now, mark how one man is allowed to steal a horse with impunity, and another man may not even look over the hedge without being thrown into jail for it. Henry Ward Beecher, in one of his contributions to the *Ledger*, recently expressed the following sentiments; and turn them which way you will, they merely amount to the very same doctrine recently promulgated by Dr. Hull, and—we are almost afraid now to avow it—firmly believed in by ourselves; namely, that the larger the masses may be in which you grow any crop, the more will destructive organisms prey upon it:

The only way to exterminate the Canada thistle is to plant it for a crop, and propose to make money out of it. Then worms will gnaw it, bugs will bite it, beetles will bore it, aphides will suck it, birds will peck it, heat will scorch it, rains will drown it, and mildew and blight will cover it.

But does Henry Ward Beecher, after publishing such shocking sentiments, escape with as much impunity as his more fortunate compeer, Dr. E. S. Hull, of Alton, Ills.? Quite the contrary! Forthwith a writer in the *Christian Intelligencer*, signing himself "Puritan," is down upon the reverend gentleman like a thunderbolt, accusing the poor man of "veiled profanity," and arguing the question in the following lucid and certainly most original manner:

These bugs, beetles, aphides, heat, rain, and mildew, are the messengers of God. If they are sent—they *are on an errand for God!* Now, if the above extract has a point, it is that when mankind plant a crop of any kind of grain or seed, *God takes a malicious pleasure in defeating such schemes.*

Excellent! Most admirable logician! But why not attack the Illinois layman as well as the New York clergyman? "Just in proportion," says Dr. Hull, "as you increase improved fruits and multiply your orchards, just in that proportion will fruit insects and fruit and fruit-tree diseases increase with you." What is that but saying, that when mankind try to grow large quantities of extra fine fruit, "*God takes a malicious pleasure in defeating such schemes?*" At him, "Puritan!" Seize him by the throat and worry him to death! The Illinois State Horticulturist is clearly guilty of the most abominable "veiled profanity."

But it seems that "circumstances alter cases," and "the case being altered alters the case," and to parody the language of Shakspeare—

What in the layman's scientific truth
That in the parson is rank blasphemy.

For up to this day, though we always read the *Christian Intelligencer* and all the other religious newspapers with the most commendable perseverance, we have not noticed any attack in any of their columns upon the Alton philosopher—whether from the pen of "Puritan" or of any other anonymous scribbler—such as that which has been recently hurled upon the devoted head of Henry Ward Beecher.

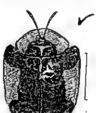
That our readers may not suppose that Mr. Beecher is unable to fight his own theological battles and has hired us, in default of a better ally, to defend him against the murderous thrusts of "Puritan," we shall close this article by quoting his most conclusive and logical reply to this most absurd and irrational attack:

This is exquisite! If mildew attacks my grapevine, it *is on an errand for God,* and if I sprinkle it with sulphur as a remedy, I put brimstone into the very face of God's messenger! When it *rains*—is not rain, too, God's messenger?—does "Puritan" dare to open a blasphemous umbrella, and push it up in the very face of this divine messenger? When a child is attacked by one of "God's messengers"—measles, canker-rash, dysentery, scarlet fever—would it be a very great sin to send for a doctor on purpose that he might resist these divine messengers? There are insects which attack man, against one of which we set up combs, and against another sulphur. "Nay," says "Puritan." "If they are sent, *they are on an errand for God,*" and it is profanity to have recourse to fine tooth combs and sulphurous ointments in order to defeat the expressed will of God.

TORTOISE-BEETLES.

"Tortoise-beetles!" the reader will perhaps exclaim, "Why, this picture that you give us in the margin is not a beetle at all, but a true veritable mud-turtle! Beetles, as you have told us time and again, have got *six* legs, and this fellow has got only *four*, two on each side of his body, which, as with other mud-turtles, are evidently used as swimming-paws." Nevertheless, kind reader, this is a true beetle, and if you were to turn him upside down, you would see that he has got, on the lower surface of his flattened body, six very distinct pale-colored legs, though they are so short that they scarcely project when stretched out at full length beyond the thin crust which, as with a mud-turtle, projects from his body all round him. What you take for swimming-paws are not paws at all, but mere patches of dark opaque color on the thin projecting semi-transparent shell. If you refer to the drawing which we gave in our last number of the Mottled Tortoise-beetle (Fig. 179), you will see that that species has two such patches of dark color, representing the front swimming-paws, while those which represent the hind paws are entirely absent. Nor is this a mere fortuitous circumstance, dependent upon variation and what gardeners call "sports." You may take a thousand specimens of either species, and you will find that our species, which is termed the Clubbed Tortoise-beetle (*Deloyala clavata*, Oliv.), always seems to have

[Fig. 1.]



Colors—Brown-black and yellowish.

four paws, while the Mottled Tortoise-beetle always confines himself to two. And what is very remarkable, there is a species found in Hindostan which is marked almost exactly like our insect.*

Of course, in such a case as this, the resemblance must be purely fortuitous; for the discrepancy in size is so enormously great, that it is impossible to believe that any, even the stupidest animal, could mistake this Tortoise-beetle for a real tortoise. In several other cases, however, of entomological mimicry, where a nest-building insect and its parasite have a strong general resemblance, it has been supposed by authors that this is a beautiful provision of nature, in order to enable the parasite to penetrate without danger into the nest of the other insect, and deposit its eggs there without interruption on the part of the nest-builder. It is contended, in fact, that, from the great resemblance between the two, the nest-builder mistakes the parasite for an individual belonging to its own species. So far as regards social insects, such as Yellow Jackets and Humble-bees, this theory will do very well; for as there are here a great number of individuals owning a nest in common, it is reasonable to suppose that a parasite, that strongly resembled the members of the community, might occasionally slip in unobserved by any one of them. But with solitary nest-building insects the case is very different. Here there is but a single individual—the female—that constructs the nest, the male taking no part whatever in this process; and even if she mistook the parasite for an individual belonging to her own species, she would be just as unwilling for the stranger to enter her own private and peculiar nest, as a hen robin would be for another hen robin to make herself at home in the nest which she has herself labored to construct. Indeed, the number of parasites that resemble the insects upon which they are parasitic is so exceedingly small —certainly not exceeding the one hundredth part of the whole number of parasites—that here we are compelled, as in the case of our tortoise-beetle, to attribute the seeming mimicry to chance.

There are, however, very numerous instances of mimicry among insects, where the mimicker gains a manifest advantage by wearing the livery of some other organism, and where consequently the imitation must be attributed, not to chance, but to design. Such are those well-known cases among the span-worms or measuring-worms, where the larva is of the same dingy brown color as the twig upon which it rests, and where it habitually stretches itself out in a straight line at angles with the twig, remaining all the time perfectly stiff and immovable, so that even the acute eyes of the practised entomologist are sometimes deceived by the manœuvre, and mistake the living and breathing worm for a bit of dead and dry stick. Such also is the case of the Stick-bug, otherwise known as "Walking-stick," which we referred to on page 58 of our First Volume, and which has the singular habit of projecting forwards its two front legs and its antennæ all in a straight line, so that the whole insect, remaining immovable in this posture, looks like a straight stick, as represented in the middle of the right hand margin of the cover to our Magazine. Such again are those other cases, where insects, for instance our common Catydid, habitually living among green leaves, imitate those leaves, not only in the general coloring of their bodies, but in the very shape and even in the style of veining of their wings. The very peculiar and remarkable case of the Imitative Butterflies, we have already treated of in a separate article.*

Unlike the four or five species of Tortoise-beetles, which we figured and described in our recent article on the Insects infesting the Sweet Potato, the Clubbed Tortoise-beetle (Fig. 1) infests, not the Sweet, but the common Irish Potato. In the West it is rather a rare insect; for in the course of twelve years' collecting we have only met with some half dozen specimens, and we are entirely unacquainted with the larva. Mr. J. B. Hartwell, however, of Wilkinsonville, Massachusetts, frequently finds the perfect beetle feeding on the leaves of Potatoes and Tomatoes, though not in sufficient numbers to be seriously injurious; and Mr. Blanchard, of the same State, meets with it quite commonly both on the cultivated Potato and on the Bitter-sweet, a weed belonging to the same genus (*Solanum*) as the Potato. Moreover, Isaac Hicks, of Long Island, N. Y., has transmitted to us no less than twenty-six specimens, all found upon potato-stalks in his neighborhood. Thus, as the Tortoise-beetles previously figured by us mostly infest plants belonging to the *Convolvulus* Family, such as Sweet Potato and Morning Glory, the species that we have now to do with seems to be confined to plants belonging to the closely allied *Solanum* Family, such as the Potato, the Bitter-sweet and the Tomato. It is remarkable that the East Indian

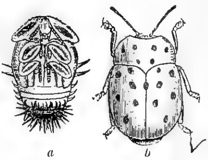
*Westw. *Introd.*, I, p. 379 and p. 377, Fig. 12.

* Amer. Entomologist, Vol. I, pp. 189-193.

species, just now referred to as being almost the exact counterpart in coloring of our Clubbed Tortoise-beetle, occurred in the Botanic Garden at Calcutta upon a convolvulus; but to what genus this insect belongs, authors do not inform us.

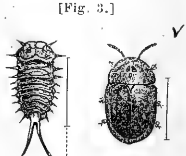
The larvæ of all the Tortoise-beetles, belonging to the genera with the body greatly flattened (*Cassida* and *Coptocycla*), always have the prickles that project from their bodies sprangled or barbed, as will be remarked from our figures 174, 177, 179 and 180. In the genus (*Chelymorpha*), to which belongs a brick-red insect with black spots (*Ch. cribraria*, Fabr., Fig. 2 *a*, pupa; *b* beetle) found upon Milkweed (*Asclepias*), and which has the body greatly rounded above with scarcely any lateral flange, the larva, as observed by Dr. Packard, has the prickles smooth and not sprangling. In the genus *Physonota*, to which belongs a new species figured herewith, the Five-dotted Tortoise-beetle (*Ph. quinquepunctata*, n. sp., Fig. 3, *b*), and which is intermediate in form between the last named genus (*Chelymorpha*), and those with the body greatly flattened (*Cassida, Coptocycla, Deloyala*), the prickles of the larva are also smooth, as may be seen by referring to Figure 3 *a*. Thus it results that structural differences in the perfect beetle are accompanied by corresponding structural differences in the larva.*

[Fig. 2.]



Colors—(*b*) brick-red and black.

[Fig. 3.]



Colors—(*b*) greenish-yellow.

As a general rule, to which as usual there are several exceptions, it is also the case that structural differences in this group of plant-feeding insects are accompanied by structural differences in the groups of plants upon which they ordinarily occur. We have seen that certain genera (*Cassida* and *Coptocycla*) are peculiarly attached to the *Convolvulus* Family; that another genus (*Deloyala*) haunts the *Solanum* Family; and that a fourth genus (*Chelymorpha*) is generally found on Milkweed. The genus to which the Five-spotted Tortoise-beetle belongs (*Physonota*) seems to be confined to the botanical Family *Compositæ;* for although we have not been able to ascertain the food-plant of this particular species, we have observed the One-dotted Tortoise-beetle (*Physonota unipunctata*, Say), feeding in the larva state upon a Sow-thistle (*Sonchus*); and as the name denotes, the Sunflower Tortoise-beetle (*Phys. helianthi*, Randall), which we were assured by Dr. Le Conte in 1865 is rightfully referred to this genus must feed upon Sunflower (*Helianthus*).

In the second and third number of our first volume we gave an account of eleven distinct species of insects, including the Black Blister-beetle (*Lytta atrata*), that attack the potato. The Black-rat Blister-beetle (*Lytta murina*), which is frequently confounded with the Black Blister-Beetle, though the former appears early in July and the latter not till the middle of August and forepart of September, has since been received by us from Mr. Munger of Lone Cedar, Minnesota, with the statement that it nearly ruined some fields of potatoes there in the forepart of July. To this formidable list of eleven distinct kinds of Potato Bugs, we must now add the Clubbed Tortoise-beetle, which no doubt works upon the potato in the larva, as well as in the perfect beetle state, though there is as yet no direct evidence to that effect.

It thus turns out that there are no less than a dozen different kinds of Potato Bugs, differing from each other in size, in shape, in coloring, in habits, in the number of broods produced in a single year, in their geographical distribution, and what is of most practical importance, in the best and most available method of fighting them. And yet we can scarcely take up a paper, whether political or agricultural, without stumbling upon some paragraph informing us that "THE Potato Bug" is behaving thus and

* We annex the scientific description of the Five-dotted Tortoise-beetle. The genus was determined for us in 1865 by Dr. J. L. LeConte, according to Boheman's arrangement of the Family.

PHYSONOTA QUINQUEPUNCTATA, n. sp. Pale greenish yellow. *Head* with the basal half of the antennæ polished both above and below, and black above; the terminal half opaque and black both above and below. *Thorax* polished and glabrous, with three black spots behind the middle, equidistant from each other and from the hind thoracic angles; the middle spot often elongate and always more advanced than the other two. Before the middle black spot a double dark olive spot, composed of two trapezoidal spots transversely arranged and not unfrequently more or less confluent with each other. *Scutel* pale. *Elytra* sparsely and rather coarsely punctured, with all but the exterior margin of a more or less pale dull olive color, the olive-colored portion of each elytrum dotted with pale yellow and with a large pale yellow round spot always a little before the middle, the pale yellow dots and spots slightly raised and impunctate. *Thorax* beneath a little varied with black. *Venter*, except the tips of the joints, black. *Legs* with a more or less extensive abbreviated superior spot on the femora, and an exterior line on the tibiæ, black. Length 0.38—0.50 inch. Twenty specimens.

Might be readily confounded with *Ph. unipunctata*, Say, but differs, 1st. by the basal joint of the antennæ having no black spot below; 2d. by the greater number of spots on the thorax (5 instead of 1); 3d. by the scutel being pale, not dark; and 4th. by the disk of the elytra not being unicolored and uniformly punctured.

so in such and such a locality. The Editors might just as well tell us, by way of important and interesting news, that "THE man" was elected to the United States Senate from such and such a State, and that immediately upon his election he married "THE woman."

SCIENTIFIC NOMENCLATURE.

A correspondent from California, Mr. C. P. Faulkner, puts the following questions to us, the answers to which we propose to give in the following article, inasmuch as those answers cannot be comprised in any very limited compass, and will perhaps be interesting to many others of our readers:

1. How is it that the Striped Cucumber Bug is called "*Diabrotica vittata*" in the *Practical Entomologist*, and "*Galeruca vittata*" in Harris's *Injurious Insects?*
2. Should "*Lytta vittata*" be called "*Epicauta vittata?*"
3. Should "*Lytta cinerea*" be called "*Macrobasis Fabricii?*"
4. Should "*Lytta marginata*" be called "*Epicauta cinerea?*"

Every scientific name for every species, whether of animals or of plants, consists of two words either simple or compound, the first of which is the generic and the second the specific designation of the particular species treated of. In popular language the order of these two words is always reversed; for we say "White Oak," "Burr Oak," "Live Oak," etc., in Botany; and in Zoology "Cinnamon Bear," "Grizzly Bear," "Black Bear," etc., instead of "Oak White," etc., and "Bear Cinnamon," etc., as these same words would be arranged according to scientific rule. This is because scientific names are always Latin or what passes for Latin, and in Latin, as in French, the adjective usually follows instead of preceding the substantive. In English, on the contrary, the adjective must almost invariably come before the substantive to which it belongs.

Specific Names.

As regards the specific name, the general rule in science is, that when once given and established by a suitable published description it must not be changed, unless it is manifestly incorrect and ungrammatical, or unless the same name has previously been applied, by some other author, to some other species belonging to the same genus, or, technically speaking, when the name is "pre-occupied." For example, a very large number of our North American Insects received specific names a hundred years ago from Linnæus, and retain those very same names to the present day. The only disputable point here is, what is to be done when a species has been named and described by B in some work of scientific authenticity, and when the name given to this species by B has been universally received by the whole scientific world for ten, twenty, or perhaps even fifty years, provided it should subsequently be discovered by C that several years before B wrote and published, A gave to this very same species, in some obscure publication of perhaps of but little or no value, another and a very different name, along with some kind of brief description. According to what is known as the "Law of Priority," interpreted in its utmost rigor, A's name takes precedence of B's, and all the labels in all the Cabinets in Christendom have to be changed so far as regards this particular species. Why? Because it is held that A, who is supposed to have established a kind of scientific pre-emption to his new species, will be unjustly treated and dishonored, if his scientific name is not adopted, although perhaps the description upon which that name is based is so brief, obscure, incorrect and unsatisfactory, that it is very doubtful whether it really applies to B's species, which may have been described by B fully, clearly and correctly. And yet, in the majority of such cases as these, A is in his grave, and perhaps it would have been a positive benefit to science if he had never been born. So that the practical result is, that, for the sake of appeasing the indignant ghost of some obscure and long-forgotten naturalist of the last century, all the naturalists of the present day are to be inconvenienced, and a great deal of valuable time is to be expended in studying out mere scientific *phrases*, which time might be employed to much better advantage in studying out new scientific *facts*.

The popular reader can form no notion of what a nuisance this perpetual disinterment of old buried names has become in the scientific world, but by putting an analogous case in common life. Suppose a set of industrious antiquaries were to busy themselves in investigating the genealogies of all the leading business men in the United States, and were to prove by the most satisfactory documents from the different Heralds' Colleges in Europe, that Smith's correct name was Jones, and Thompson's proper appellation was Johnson, and Cook's real title was Taylor; and suppose it was the established law that all these unfortunate men had to give up their old names and take up with the new-fangled ones. What confusion there would then be between the old firms of Smith &

Thompson or Cook & Smith, and the new firms of Jones & Johnson, or Taylor & Jones? How everybody would be bothered and tormented, for no earthly purpose, except for the special gratification of the very learned antiquaries who, by toiling without pay or reward for a long series of years, and by covering themselves with the dust of all the libraries in Europe, had made these most valuable and important discoveries! It is just so in Science. This year an insect bears the specific name which it has borne for the last ten or twelve years. Next year some entomological archæologist, who knows a great deal more about books than about bugs, insists upon its receiving a new name, being an old name which he is of opinion was given to this same insect fifty years ago by some ancient author. Well, the obedient scientific world submits to his dictum—relabels its cabinets—and begins gradually to acquire the habit of addressing Mr. Smith as "Mr. Jones." But—lo and behold!—the very next year there comes a still more recondite antiquary, covered three inches deeper with learned dust than his predecessor, and insists upon it that this very same bug was named and described one hundred years ago by an old forgotten author, whose writings are now completely out of date! Alas for the poor helpless victims of the inexorable "Law of Priority!" Everybody has to adopt the newly-discovered name; and while nineteen naturalists out of every twenty curse these archæologists, in their hearts, as the greatest of all possible scientific nuisances, they yet laud them most vigorously in public, as ornaments of science and discoverers of the most important truths. But we have not yet arrived at the last scene in this scientific farce. After our two antiquaries have successively covered themselves with glory by rebaptizing twice over the very same insect, some ingenious person comes along who has access to some European Cabinet of Insects, in which original specimens of several of the species named by old authors are preserved. Upon carefully examining these specimens, he discovers that the two antiquaries are both of them mistaken, and that the two species described by the two old authors are quite different from that which has given rise to all this wilderness of assertions and argument. The result of course is, that we have to return to the original name, and all the cabinets in the world have for the third time to receive new labels. To recur once more to our homely illustration from popular life—we are first compelled to call Mr. Smith "Mr. Jones," and then just as we are getting used to calling him "Jones," we have to give up "Jones" and take perforce to "Thompson" or "Cook." And finally, after all this useless and wearisome chopping and changing, we have to return like a dog to his vomit and call Mr. Smith by his original appellation of "Smith."

Certain scientific associations and certain authors—Dr. Schaum for example—have endeavored to limit and restrict the above abuse of the "Law of Priority." For ourselves, we must confess that we agree with Dr. Schaum and the rest of that school; but at present the fashion tends in the contrary direction, and naturalists are now, many of them, as busily occupied in discovering new names as ladies are in inventing new bonnets, and perhaps with much the same benefits to the cause of science. To us, it appears that a single new fact about the habits of an insect, or a single new idea upon its correct position in the scale of classification, are of far more importance than the knowledge of what particular name it bore some fifty or a hundred years ago. Of course such inquiries as these last are to a certain extent interesting and instructive; and so it is just as well for us to know that New York was formerly called "New Amsterdam," and that London was known to the ancient Romans, not as London, but as "Londinium." Nobody, however, but a fool or a madman would try to persuade the modern Gothamites to call their great city "New Amsterdam," or the English cockneys to have their letters addressed to "Londinium," because these were the old original names. And yet what men of the world would never dream of doing, certain scientific men are busily engaged in doing every day. For unfortunately the entomological antiquaries are never satisfied with simply proving to their own satisfaction that certain species, now universally known by certain specific names, were known a long time ago under other names. But they will insist upon having the privilege of forcing these old-fashioned names down the throats of their neighbors, by virtue of this tremendous "Law of Priority."

To apply the above remarks to the third and fourth questions of our correspondent: About the middle of the last century a German author called Foerster, is thought to have named and described as the "Ash-gray Blister-beetle" (*cinerea*) the very same species of insects, which Fabricius several years afterwards named and described as the "Margined Blister-beetle" (*marginata*), and which was for a long series of subsequent years known in the scientific world exclusively by this latter specific name. As both Harris and Fitch make use of this name, and it has thus become familiarized to the popular ear in America, we ourselves adopted it in our first volume (page 25). And thinking as we do of the necessity of not pushing the "Law of Priority" to its extremest point, we maintain that this name, the "Margined Blister-beetle," having been once firmly established and received in science, ought never to be changed. Of course, the ultra advocates of the "Law of Priority" will be of the contrary opinion; and this being a free country, everybody can think and act for himself. After all, it is a mere question of *words* and not of *things;* and even those that maintain such changes as these to be necessary will allow that they are an unmitigated nuisance.

On the whole, such scientific reconstructions strike us very much like those heraldic anomalies of the British aristocracy, according to which the man whom we read of in history as Danby, subsequently becomes Marquis Carmarthen, and finally Duke of Leeds. Or we may compare them to the ancient law of the Sandwich Islanders, that, on the death of every King of those islands, so many score words in their language should be radically changed, so that, instead of "bread" and "stone" for example, being called "whang" and "choch," they should, in commemoration of the deceased monarch, be forever thereafter known as "chum" and "fum."

If the reader adopts the views expressed by us above, "the Ash-gray Blister-beetle" (*cinerea*) is the correct specific name for the species which was designated by this appellation by Fabricius after Foerster published his work. If, however, the Margined Blister-beetle is to be rechristened as "the Ash-gray Blister-beetle," in accordance with the strict Law of Priority, then the specific name of "Ash-gray" (*cinerea*) is preoccupied, provided we refer both insects to the same genus. And in that event no new specific name can be more appropriate and in accordance with rule than *Fabricii*. We cannot understand, however, why both insects should not bear the same specific name (*cinerea*), provided they are referred to different and distinct genera, as is now generally done in purely scientific works.

In any case, if we are careful to add to the specific name the name of its author, there can practically be no confusion or mistake. Everybody, for example, will understand at once, that "*Lytta cinerea*, Foerster," means the Blister-beetle described under the name of *cinerea* by Foerster and "*Lytta cinerea*, Fabricius" means the very different Blister-beetle subsequently described under the very same name of *cinerea* by Fabricius.

Generic Names.

As a general rule, species may be considered as having a real existence in nature, and as creations which, however much they may become changed and modified in a long series of indefinite ages, are yet practically unchangeable within the very limited times to which the knowledge of the present generation extends. Take, for example, the magnificent group of Moths formerly comprised by Linnæus under his extensive genus *Attacus*, to which the *Polyphemus* Moth, figured on page 121 of our first volume, belongs. In the United States there are four species of this group commonly met with, besides two or three others which are more or less rare. Thousands of specimens of each of these four species pass annually through the hands of American Entomologists; and yet nobody ever met with a single specimen, which could not be referred at a glance to its appropriate species. With genera the case is very different. It will be allowed on all hands that a genus is not a definite and unchangeable creation—the same in the days of our grandfathers as it is now, and likely to remain the same till the days of our grandchildren. On the contrary, genera in the scientific world are in a constant state of fluctuation, two or three old genera being sometimes amalgamated together to form a new one, but the more usual tendency being for one old genus to be split up into several new ones. For instance, the four splendid Moths referred to above, which in the times of Linnæus and his immediate followers were all considered as belonging to the same genus, are now referred by almost all scientific entomologists to three distinct genera, and in the opinion of some few are divided among no less than four—or a genus for every single species. No doubt, in the great majority of cases, this subdivision of one old genus into several new ones is a benefit to science and a great practical convenience to the student. When, for example, an old genus contains a very great number of species—say fifty or a hundred—and we wish to ascertain whether a species that belongs to it has been already described, we then have to compare our species with no less than fifty or a hundred different descriptions before we can decide the question one way or the other. Whereas if this unwieldy old genus had been separated by well-marked characters into four or five new genera, each containing some twenty-five or thirty species, we should manifestly then have a much smaller number of descriptions to refer to. It must be confessed, however, that in many instances small genera, containing but a very few species, are unnecessarily cut up into a number of new genera each containing but one or two species, while on the other hand large unwieldy genera are rendered still more unwieldy by amalgamating them with other large genera. Usually this latter process is had recourse to, because one or more species are discovered, which form a sort of transitional stage or intermediate grade between the two large genera. Such species are generally called "aberrant;" and probably, if all the species that ever existed in the world in all geological time were placed side by side, there would be no two genera in Nature, that would not then graduate into one another imperceptibly by such aberrant forms. In such a case as the above, therefore, instead of uniting two large genera, and thereby making the rich richer still, as by splitting up small genera the poor are made poorer still, the appropriate course seems to be indicated by Audubon and Bachman in the following passage:

> In every department of Natural History, a species is occasionally found which forms the connecting link between two genera, rendering it doubtful under which genus it should properly be arranged. Under such circumstances, the Naturalist is obliged to ascertain, by careful examination, the various predominating characteristics, and finally place it under the genus to which it bears the closest affinity in all its details.—*History N. A. Quadrupeds*, Vol. II, page 215.

Up to a comparatively recent date, the general opinion has been that generic characters should be founded exclusively upon structural peculiarities, and that color is not a generic but a specific distinction. It is now, however, beginning to be recognized in science, that there are certain colors and colorational patterns peculiar to almost every genus, and which are therefore as truly generic characters as the minutiæ of structure usually employed for that purpose. Take, for example, a few of our largest and best known genera of Butterflies. We shall find that *Argynnis* is usually some shade of tawney-red with zigzag lines running across its wings in a very remarkable pattern; while *Hipparchia* and its allies are brown with eye-like spots transversing its wings near their tips; and *Colias* ranges from white through sulphur-yellow to orange, with the tips of its wings black and a small silvery spot in the middle of each wing below. It is on this account, as well as for other reasons, that we believe those authors to be in error, who have referred our N. A. *Cecropia* and *Promethea* moths and the Asiatic *Cynthia* moth to three distinct genera; for in all three may be found very nearly the same coloring and the same very peculiar colorational pattern.

To return to the questions asked by our correspondent: The old and very extensive genus *Lytta* has been very satisfactorily divided by Dr. Le Conte into a number of new genera, such as *Macrobasis*, *Pomphopœa*, etc. If we were writing a purely scientific Paper for the Proceedings of some learned Society, we should certainly name the insects specified by Mr. Faulkner as *Epicauta vittata*, Fabr., *Macrobasis cinerea*, Fabr., and *Epicauta marginata*, Fabr., instead of referring them all three to the old genus *Lytta*. But writing as we do for the popular eye, and endeavoring to simplify as much as possible that technical nomenclature, which in spite of all the sauce we can serve it up with is still so distasteful to many palates, we have preferred to follow Dr. Harris's example and use the more generally known generic appellation for all these three insects. For similar reasons, Harris called the Striped Cucumber Beetle *Galeruca vittata*, instead of *Diabrotica vittata*, *Galeruca* being the old genus, which included a great number of the less extensive modern genera, such as *Diabrotica*.

One word more and we have done with this somewhat dry subject. It should never be forgotten that scientific nomenclature is a means and not an end. It is necessary to be able to name with accuracy and precision each organized being, before we can record any knowledge that we may have acquired concerning it, or understand such knowledge when recorded by others. And as Law is said to be "the perfection of human reason," so Science may be perhaps sufficiently well characterized as the perfection of human accuracy. But to learn by rote the names of a great number of organisms, without any intention of applying what we have learned to any ulterior purpose, and without troubling our head one particle about the grand system upon which all scientific classification is based; is about as unprofitable a task as the human mind can be employed in.

☞ 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.

ON THE PRESERVATION OF ENTOMOLOGICAL CABINETS.

BY JOHN L. LECONTE, M. D.

[From the American Naturalist for August, 1869.]

I have tried at various times many experiments for the preservation of collections of insects, but with such limited success that I did not think the results obtained worth publishing. For the sake of deterring others from pursuing these different lines of unsuccessful attempts, it would be useful, perhaps, to give a brief account of my failures before describing a process recently devised, which seems to be both simple and effective.

Corrosive sublimate and various preparations of arsenic have been recommended by several high authorities. The former, even when most diluted, will finally render the pin brittle by the amalgam developed; the latter, when used in a very weak alcoholic solution so as to leave no efflorescence on the specimens, will preserve them well, but it is troublesome to apply, as the insects must be thoroughly soaked with the fluid before being placed in the cabinet. Binarseniate of potassa being deliquescent, suggested itself to me as a material that might be applied in greater strength, and many years ago I prepared two boxes of specimens with it. They had a good appearance for some time, and have never been attacked, but eventually a considerable deposit or efflorescence came on the surface, so that the specimens required cleaning before they could be used for study.

Painting the interior of the boxes with arsenious acid was also only partially successful; I have seen, though not often, living larvæ of *Trogoderma* in boxes thus prepared.

Having thus failed in finding any satisfactory mineral poison I then tried the vegetable alkaloids.

I soaked specimens in moderately strong alcoholic solutions of strychnia and picrotoxia, dried them, and put them into pill boxes with *Trogoderma* larvæ. After some weeks the specimens were partly eaten, and the larvæ transformed into perfect insects.

The effects of benzine and carbolic acid are powerful, but only temporary. The former is preferable on account of its less disagreeable odor, and may be used by pouring about a teaspoonful in each box; it must be renewed every four or five months.

Packing the collection in chests painted with coal-tar has been also recommended, and would certainly be efficient, but troublesome, and renders the collection, practically, nearly useless for study, on account of the difficulty of access to the boxes. Surgical art has, however, given to us an instrument by which a poisonous liquid can be rapidly and most effectively applied to the entire surface of large numbers of specimens as they stand in the cabinet boxes, without the trouble of moving them. I refer to the *Atomizer*. Opinions may vary as to the nature of the liquid poison to be used, but after several trials I have found the following formula to be quite satisfactory; it produces no efflorescence, even on the most highly polished species, while the odor is quite strong, and persistent enough to destroy any larvæ or eggs that may be already in the box:

Saturated alcoholic solution of arsenious acid, eight fluid ounces; Strychnine, twelve grains; Crystallized carbolic acid, one drachm; Mineral naphtha (or heavy benzine) and strong alcohol, enough to make one quart.

I have not stated the quantity of naphtha, since there are some varieties of light petroleum in commerce which dissolve in alcohol only to a slight extent. These should not be used. The heavier oils which mix indefinitely with alcohol are the proper ones, and for the two pints of mixture ten to twelve fluid ounces of the naphtha will be sufficient.

Care should be taken to test the naphtha on a piece of paper. If it leaves a greasy stain which does not disappear after a few hours, it is not suitable for this purpose.

The best form of atomizer is the long, plated, reversible tube; it should be worked with a gum elastic pipe, having two bulbs to secure uniformity in the current. The atomizing glass tubes and the bottle which usually accompany the apparatus are unnecessary: a common narrow-necked two ounce bottle will serve perfectly to hold the fluid.

I trust that the use of the means here indicated may render the preservation of insect collections less troublesome than heretofore, and thus increase the interest of amateurs who frequently become disgusted with the science of entomology, by seeing the results of years of active and intelligent labor destroyed by a few months of inattention, or by carelessness in introducing infected specimens.

KILLING APPLE-WORMS BY MACHINERY.

The world certainly moves! Men are constantly making discoveries, which though trivial in themselves, greatly benefit their fellow-men. The hay-band remedy against the Apple-worm (*Carpocapsa pomonella*, Linn.) is an excellent one, but we are obliged to seek for the worms which spin up under it, and crush each one separately. Mr. D. N. Brown, an enterprising fruit-grower of St. Joseph, Mich., has however devised a plan of slaughtering them by wholesale, which commends itself to the good sense of every apple-grower. Here it is, as given in a late number of the St. Joseph *Herald*, by our friend and correspondent, L. P. Haskell of that place:

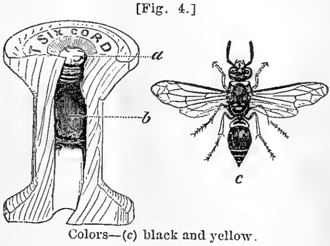
"Place early in June *rags*, not hay bands, in the forks of the tree, or trunk below the lower limb, and in these the larvæ will secrete themselves to enter the chrysalis state. Once in two weeks remove these rags, and destroy the insects. Mr. Brown does it very quickly and effectively by passing the rags through a clothes-wringer. In this manner he believes the nuisance may be got rid of; and yet the effort will be useless unless every owner of an orchard does the same thing. There must be *united* effort. Let every man feel it his duty to urge his neighbor to act at once and persistently, remembering that, 'eternal vigilance is the price of'—*good fruit*."

A POTTER-WASP.

(*Odynerus flavipes?* Fabr.)

In our article on "Wasps and their Habits," in Vol. I, No. 7, of the AMERICAN ENTOMOLOGIST, we showed how the various kinds of solitary Wasps provisioned their nests with different kinds of insects and spiders—how they first stung these little creatures so as to paralyze but not to kill them—and how the egg deposited by the mother-wasp, along with this living but dormant prey, subsequently hatched out into a soft defenseless larva, which fed at its ease upon the living provisions accumulated and stored up with such provident care by the author of its being. On page 138 we cursorily referred to the genus *Odynerus*—a very extensive group of the Solitary True Wasps, of which there are no less than ninety-nine described species found in North America. Several European species belonging to this genus are known to provision their nests with green lepidopterous larvæ, some of them excavating holes in sandy banks, some building their nests in the interstices of stone walls, and some selecting for that purpose wood that had been honey-combed by boring larvæ. We have a small North American species in our collection, which had made two nests in the central hole of a common wooden spool upon which cotton had been wound, closing up each end of the hole with tempered clay and separating one nest from the other by a partition of

[Fig. 4.]



Colors—(c) black and yellow.

the same material. (See Fig. 4, *a*, *b*.) For this specimen and the spool in which the nests had been constructed we are indebted to Miss Marion Hobart, of Port Byron, N. Ills. Quite recently we have received a much larger species, which we figure herewith (*Odynerus flavipes?* Fabr., Fig. 4, *c*), from Mr. E. Daggy, of Tuscola, Central Illinois, with the following account of its operations:

Enclosed I send you five small worms, one brown and four green ones. They came to my notice as follows: I was sitting in the sanctum of the *Journal* office this morning, and saw a yellow jacket or wasp deposit one of these worms in a hole in the top of a common black wooden ink-stand which was upon the table just before me. After the wasp had coiled it down nicely it left, and I of course examined to see what was done. I saw there were more than the single worm, so I left it, to await results. Presently the wasp returned, but not with a worm, and worked some little time with its head in the hole where the worms were. After it left, I noticed that the hole was sealed over with mud; presently it returned with still more mud, and thrice this operation was performed. On examining the contents of the hole in the ink-stand, I found, to my astonishment, thirty-five worms in it, doubtless the work of the same wasp. I send you five of these, wasp and all, as I have just captured it since I commenced writing to you.

It has been supposed by some entomologists that Wasps always provision the same nest with the same species of insect. But the five worms forwarded to us by Mr. Daggy, which averaged about one-third of an inch in length, although they were all the larvæ of small moths, mostly leaf-rollers, yet belonged to at least three distinct species. Along with them was sent a Wasp-larva which had attained maturity and already spun its cocoon, showing that there must have been more than one nest built by the mother wasp in the hole in the ink-stand, and that the tenant of the bottommost nest had already consumed its private and peculiar stock of larvæ and was preparing to lie up for the winter. In the cotton-spool, which was less than one and a half inches long, there were, as we have seen, no less than two distinct nests, although both ends of the central hole had to be filled up with clay to fit it for the purpose for which it was employed.

In the drawing which we have given above of this Potter Wasp (Fig. 4 *c*), the wings are represented as fully expanded. In repose, however, they are always doubled over upon themselves in the singular manner shown in figure 96, page 123 of our First Volume. This is a remarkable peculiarity of the True Wasps (*Diplopteryga*), not to be met with in a single species of the Digger Wasps (*Fossores*), although these last have precisely the same general habits as the *Solitary* True Wasps, to which our species appertains. The habits of the *Social* True Wasps, such as the Yellow Jackets, the Bald-faced Hornet, etc., are entirely different from those of the Solitary True Wasps; and yet their wings are folded in repose in exactly the same manner.

☞ The publishers of those papers which advertise to club with ours, will please take notice of our change of subscription price.

TOMATO-WORMS NOT POISONOUS.

For some unaccountable cause there are certain of God's creatures, that everybody seems to take a pleasure in vilifying and slandering, while on the other hand there are others that are almost worshiped in the popular mind. For instance, Toads and Snakes are considered by most persons as all of them equally poisonous and dangerous; whereas in reality the number of venomous snakes to be found in the United States may be counted on the fingers of one hand; and as to Toads, they may be freely handled with the most perfect impunity, and they prove themselves to be one of the very best friends to the gardener and the farmer by preying to a great extent upon noxious insects. On the other hand our small birds are considered by many as a kind of Sacred Animal, that it would be as impious for us to shoot when they are destroying our grapes and our cherries, as it would be for a Hindoo to drive away the holy Brachman Bull when that Bull is devouring his rice-crop before his very eyes. Among our insect friends, however, we find but very few that are popular favorites, the only instance that occurs to us at present being that of the Lady-birds (*Coccinella* family), which are the children's pets all over Europe, and are known in France as "the Virgin's Cattle," and "God's Cows." With this exception, perhaps, all other insects are commonly devoted to destruction as ugly and hateful abominations, which it is dangerous to touch and ridiculous to admire. More especially are the different kinds of Caterpillars, or "worms" as they are often called, which are the larvæ of our multifarious species of Butterflies and Moths, objects of the most unmitigated disgust. And perhaps of all these none is in worse repute than the common Tomato-worm.

This larva belongs to an extensive group (the *Sphinx* Family), almost all of which have a stiff pointed horn growing out of their tails — a merely ornamental appendage, such as those which are distributed in considerable numbers over the body of the magnificent larva, which we illustrated in the Frontispiece to our first volume. Why or wherefore it is impossible to say, but this poor unfortunate Tomato-worm has been selected by the popular voice, out of about fifty others belonging to the same Family and found within the limits of the United States —all of which have a similar horn growing out of their tails—to be falsely accused of using this horn as a sting. The Tomato-worm and the Tobacco-worm are as like as two peas, and produce moths which resemble each other so closely, that entomologists for a long time confounded them together. Each has exactly the same kind of horn growing on the hinder extremity of its body; yet while the Tomato-worm is generally accused of stinging folks with this horn, nobody, so far as we are aware, ever yet said that the Tobacco-worm would or could do so. The real truth of the matter is that neither of them can sting, either with its tail, or with its head, or with any part of its body. Yet not a season elapses but the newspapers publish horrible accounts of people being stung to death by Tomato-worms, and earnestly recommend those that gather tomatoes to wear heavy buckskin gloves. These stories, however, have been contradicted so flatly and so often, that latterly the penny-a-liners have struck off upon another tack. Tomato-worms, it appears, do not sting with the horn that grows on their tails, but they "eject with great violence a green caustic fluid from their mouths to a distance of from three to fifteen inches"!! Now what is the real truth about this matter? Tomato-worms do really discharge from their mouths, when roughly handled, a greenish fluid, and so do the larvæ of almost all moths, and so does every species of grasshopper with which we are acquainted, and so do many different kinds of beetles. But it is not true that they can spit out this fluid even to the distance of a quarter of an inch, much less to the distance of fifteen or even of three inches; and especially it is not true that the fluid is poisonous. If it were so, we should have been in our graves long ago; for we have had it repeatedly daubed over our fingers, but without the least ill effects therefrom, and so have scores of other entomologists in this country. The strangest thing of all is, that of two worms almost exactly alike, one of which eats tomato leaves, and the other eats tobacco leaves, the tomato-chewer should be accused of spitting, and the tobacco-chewer should be held to be guiltless of this offensive practice.

Now then, Gentlemen of the Public Press, if Tomato-worms neither sting nor spit, what is the next charge that you are going to bring against them? Why not assert that they can leap a distance of from ten to twenty feet, having taken deadly aim at the human eyes, which they forthwith proceed to gouge out with their rough rasp-like pro-legs? Of course you would follow this up by recommending everybody never to go near a tomato patch, without a large pair of green goggles to protect the eyes from being destroyed.

GOOSEBERRY AND CURRANT WORMS.

We candidly confess that we are discouraged. Nearly a year ago we published a full account of the different Potato Bugs to be found in the United States, showing that there are about a round dozen of perfectly distinct species attacking the Potato plant—some burrowing in the stalk, but most of them devouring the leaves—some infesting the plant both in the larva and in the perfect state, others in the perfect state exclusively—and most of them to be found all over the Union, while one of them is almost entirely confined to the Eastern States, and another is at present only to be met with in the West, though it is gradually advancing with giant strides towards the devoted East. In that article we further pointed out the practically very important fact, that different Potato Bugs having different habits must be attacked in different modes; and that what is excellent sauce for the goose will often turn out to be very poor sauce indeed for the gander. Yet—wonderful to relate!—in spite of all our efforts to disseminate correct knowledge on this subject, several newspapers have continued to publish paragraphs through the summer of 1869, showing how "THE Potato Bug" has done thus and so in such and such a neighborhood! They might just as well publish as interesting and satisfactory news, that "THE sheep" took the first premium at such and such a Wool-growers' Convention, or that "THE horse" won the race at the last meeting of the Honorable Jockey-Club of Swindleton.

What then, under the circumstances, are we to do? Shall we give up in despair and discontinue the ENTOMOLOGIST, simply because it is demonstrated by hard dry facts, that such a paper is urgently needed, and that the popular ignorance on the subject of insects urgently requires to be enlightened? Far from us be such faint-heartedness! We acknowledge that we find a great many very "hard cases" among our adult population—men who maintain stoutly, that it is beneath the dignity of the human species to pay any attention to these infinitesimally minute little creatures, which are every day picking our pockets of untold millions of dollars. But we have great faith in the rising generation. School Superintendents are now beginning to recognize the fact, that Natural History is not only a very pleasing, but practically a most important study; and that as insects outnumber tenfold all the other animals in the world put together, so they annually inflict upon us ten times as much pecuniary damage as all the other animals in the world put together. Hence the very legitimate inference is drawn, that of all the various departments of Natural History, Entomology, viewed in the light of dollars and cents, is of the greatest practical importance; and but for the want of competent teachers and suitable text books, it would no doubt be introduced at once, as a regular branch of study, into all our best schools. We would suggest, however, to those who have such matters under their official charge, that where there is a demand there will always sooner or later be a supply; and that the very best way to create a demand for good Entomological Text-books, suited to the comprehension of children, is to disseminate among children a taste for the more pleasing and popular branches of Entomology. It is for the express purpose of creating such a taste in the public mind, that our Magazine has been set on foot; and in spite of our well-known modesty, we cannot help throwing out a hint here, that worse text-books than the AMERICAN ENTOMOLOGIST might on a diligent search be found in some of our public schools. But we must stop here. The publisher gravely admonishes us, that if our little work were generally introduced into all our Public Schools, or even into all our High Schools, it would be utterly impossible for him, with his present typographical facilities, to supply the demand for it. Such an idea, if practically carried out, would certainly ruin him; for he would then have to purchase, at a vast expense, one of the Patent Forty-Cylinder Printing-presses, that throw off 1,539,141 impressions every five minutes.

We have determined, therefore, upon a cool consideration of the state of the case, not to be daunted or discouraged, because a few benighted individuals will still persist in talking about "THE Potato Bug," instead of telling us in so many words whether they mean the Colorado Potato Bug, or the Ash-gray Blister-beetle, or the Three-lined Leaf-beetle, or whatever the particular species of Potato Bug may be that is destroying their potato-vines. We have thrown our bread upon the waters; we hope and believe that, after many days, or at all events after many years, it will be found and appreciated by the world. In the meantime, with unflagging resolution and unabated confidence, we shall proceed with our task. We have already given a complete history, illustrated by figures, of the different bugs that afflict the Irish Potato. We have done the same thing with those that infest the Sweet Potato. We have commenced a series of articles, throwing light upon the multifarious species that destroy the health and vigor of the Grape-vine. In the present Paper we propose to give the Natural History of three perfectly distinct kinds of worms, or larvæ as they would be more properly termed, that devour the foliage of the Currant and the Gooseberry. There are other larvæ that bore into the stems or twigs of one or both of these plants, and should rather be called "Borers" than "Worms;" but with these we have at present nothing to do. In a future Paper we shall perhaps treat of these last by themselves.

The Currant and the Gooseberry, although the general appearance of the two plants is very different, and although almost all the species of Gooseberry are thorny and bear each fruit upon a separate stem, while all the species of Currant are devoid of thorns and bear their fruit in a peculiar kind of bunch technically known as a "raceme," are yet referred by Botanists to the same genus (*Ribes*). Our common Garden Gooseberry (*Ribes grossularia*) has been introduced among us from Europe; but we have four wild species commonly found in the Northern States; and besides these four there is a Californian species, the Showy Gooseberry (*R. speciosum*), which is sometimes cultivated as an ornamental plant in our gardens, for the sake of its fine deep-red hanging flowers and red stamens. On the contrary, our common Garden Red Currant (*R. rubrum*), of which the White Currant is a mere variety, is indigenous in the more northerly of the Northern States from New Hampshire to Wisconsin, although it is also a native of Europe; while on the other hand the Black Currant of our gardens (*R. nigrum*) is a European plant, and is thought by the best authors to be distinct from our American Wild Black Currant (*R. floridum*). Besides the above we have three other Currants peculiar to America. One of these, the Missouri or Buffalo Currant (*R. aureum*), grows wild in the Far West and is often cultivated in gardens, where its small, bright-yellow, spicy-scented flowers are very conspicuous in the early spring. Another of them, peculiar to Oregon and California, the Red-flowered Currant (*R. sanguineum*), is also occasionally grown as an ornamental plant on this side of the Rocky Mountains.

We have entered into these botanical details, because it is a remarkable fact that the three different Currant and Gooseberry Worms, now to be brought under our notice, all of them attack almost indiscriminately in our gardens the Red Currant and the Gooseberry, while they are none of them ever found upon our cultivated Black Currant or, so far as is known, upon our wild Black Currant. On the other hand our common imported Currant Borer (*Ægeria tipuliformis*) infests the Red or White Currant, but is never found in the twigs of the cultivated Black Currant or in those of the Gooseberry, whether wild or tame; while our wild Black Currant has a peculiar borer of its own (*Ægeria caudata*), belonging to the very same genus as the imported species which attacks the Red Currant; and we ourselves recently noticed, in the grounds of Mr. D. F. Kinney at Rock Island, Ill., that the tips of the rank vigorously growing twigs of the tame Black Currant were extensively bored on the last of June by that very general feeder the Stalk Worm (*Gortyna nitela*).* Finally, the common Currant Plant-louse (*Aphis ribis*)—a species introduced among us from Europe—may be noticed almost every spring in every patch of Red Currants, curling up the leaves in great numbers into blister-like elevations, on the inferior surface of which it resides; while neither this particular species of Plant-louse, nor any other species so far as we are aware, is ever met with either upon the Gooseberry, whether wild or tame, or upon the Black Currant, whether wild or tame. These facts may serve to show us how unsafe it is to infer that, because one insect can thrive upon a number of different species of a particular genus of plants, therefore another insect can do the same thing.

The Gooseberry Span-worm.

(*Ellopia* [*Abraxas*] *ribearia*, Fitch.)

This may be at once distinguished from any other worm, found either on Gooseberry or Currant, by its being what is popularly called a "measuring-worm" or span-worm. The annexed sketch (Fig. 5) shews this larva in three different positions, No. 1 representing it in profile in the looping attitude, and No. 2 giving a dorsal view of it as it hangs suspended by a thread. When full-grown it measures about an inch, and is of a bright yellow color, with lateral white lines and numerous black spots and round dots. The head is white, with two large black eye-like spots on the outer sides above and two smaller ones beneath. The six true legs are black and the four pro-legs yellow. It attains its growth about the middle of June, when it descends to the ground and either burrows a

* Figured with its larva in AMER. ENTOM. I. page 22, fig. 11.

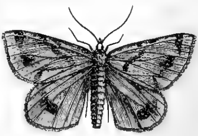
little below the surface or hides under any rubbish that may be lying there; but in neither

[Fig. 5.]

Colors—(1 and 2) yellow, black and white; (3) mahogany brown.

case does it form any cocoon. Shortly after this it changes to a chrysalis (Fig. 5, No. 3), of the usual shape and shining mahogany brown color. After remaining in the pupa state about fourteen days, it bursts the pupa shell and in the forepart of July appears as a moth (Fig. 6), of a pale nankin yellow color, the wings shaded with faint dusky leaden-colored spots arranged so as not to present any definite pattern. The sexes then couple as usual, and the female lays her eggs on the branches and twigs of the bushes. Owing to this peculiarity, the species is frequently carried in the egg state upon transplanted bushes from one neighborhood to another; which accounts for its sudden appearance in parts where it was before unknown. For there is but one brood of this insect in one year, and the eggs must consequently, like those of the Tent-worm of the Apple-tree, be exposed, on the twigs and limbs to which they are attached, to all the heats of July and August without hatching out, and to all the frosts of December and January without freezing out. At length, when the proper time arrives, and the gooseberry and currant bushes are out in full leaf so as to afford plenty of food, the tiny but tough little egg hatches out about the latter end of May, and in a little more than three weeks the worms attain their full larval development.

[Fig. 6.]



Colors—Pale yellow and faint lead-color.

This Gooseberry Span-worm was first noticed near Chicago in 1862 or '63; and for two or three years afterwards it increased rapidly, so as in most gardens not to leave a single leaf on the gooseberry, and in many instances to entirely strip the currant bushes. It is quite common also in St. Louis and Jefferson counties in Missouri, and for the past two seasons has entirely stripped the Gooseberry bushes on many farms in these counties. Elsewhere in the Western States it is not by any means common; but in many localities in the East it has been a severe pest for a great number of years, especially in the States of New York and Pennsylvania. Near Rock Island, Ill., in the course of twelve years collecting, we only met with one solitary specimen of the moth, although there are plenty of wild gooseberries growing in the woods there, which plant was in all probability its original home, before the introduction into this country of the cultivated gooseberry. We have observed that the species shows a decided preference for the gooseberry, always attacking that plant first when growing side by side with the currant. Hence we have given it the English name of the "Gooseberry Span-worm," to distinguish it from the Imported Currant Worm next to be treated of, which conversely prefers the Currant to the Gooseberry. In reality, however, as we hinted before, the "Gooseberry Span-worm" frequently becomes a Currant Span-worm, and the "Imported Currant Worm" is often to be met with performing the part of an Imported Gooseberry Worm.

It should be carefully observed that the Gooseberry Span-worm is a native American insect, not to be found on the other side of the Atlantic. In Europe, indeed, there is an allied span-worm (*Abraxas grossulariata*), which infests their gooseberry and currant bushes much in the same way as our indigenous species infests our bushes; but the larva and especially the perfect moth are marked very differently.* We mention this fact, because it was erroneously stated four years ago in an Article in the *Prairie Farmer*, that the two were identical; and because, as we shall show in a future article, the truth is here of some considerable scientific interest and involves some very curious consequences.

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*Figures of both will be found in Westw. *Introd.* II. p. 396, Figs. 1 and 3.

The Imported Currant-worm.

(*Nematus ventricosus*, Klug.)*

It is only about a dozen years since this most pernicious enemy to the Currant and Gooseberry was introduced from Europe into the United States. So far as can be ascertained, it made its first appearance among us in the neighborhood of Rochester, N. Y., and is supposed to have been imported along with some gooseberry bushes from Europe by the celebrated Rochester nurserymen, Messrs. Ellwanger & Barry. In nine years time, besides colonizing in other directions, it had gradually spread to Washington Co., N. Y., on the east side of the Hudson River—a total distance of about 225 miles. Thus, as it appears, it traveled at the average rate of some 25 miles a year, establishing a permanent colony wherever it went, and not passing through the country as a mere moveable column of invaders. In 1860 or '61 it appeared at Erie in the N. W. corner of Pennsylvania. In 1864 Prof. Winchell found it at Ann Arbor, Michigan. In 1866 it was generally distributed over the N. E. counties of Pennsylvania. And judging from a conversation which we had in October, 1868, with Mark Carley, of Champaign, in Central Illinois, this gentleman must have had it in great numbers upon his currant bushes in the summer of that year. At all events he described the worm which had infested his bushes as being green with many black spots and as not being a looper.

But besides the principal centre of distribution at Rochester, N. Y., this Currant-worm seems to have been imported from Europe at one or two other points in the Eastern States, and as at Rochester to have spread therefrom as from a focus. Unless our memory greatly deceives us, Mr. Geo. Brackett, of Maine, described this same insect many years ago, as existing in that State, though he gave it a different specific name, and was not at all aware that it had been introduced from the other side of the Atlantic. We also heard of it in the summer of 1867, from Mr. A. H. Mills, of Vermont, as being very destructive in his neighborhood. Not improbably, it was independently imported at other points in the East. Wherever it is introduced it spreads with great rapidity, and as there are two broods every year, it soon multiplies so as to strip all the currant and gooseberry bushes bare and utterly ruin the crop, besides eventually destroying the bushes, unless proper measures be taken to counteract it. Throughout the western parts of New York, as we have been informed by our ornithological friend Dr. Velie, the cultivation of currants and gooseberries has been almost entirely given up, on account of the depredations of this seemingly insignificant little savage. And, according to Dr. Fitch, at Watertown, N. Y., "it kept the bushes so destitute of leaves in most of the gardens, that in three years they were nearly or quite dead."

The Imported Currant-worm Fly (Fig. 7, *a* male, *b* female, both enlarged), belongs to the Sawflies (*Tenthredo* Family)—a group of the Order of Clear-winged Flies (*Hymenoptera*), which is remarkable for having most of its larvæ with the same plant-feeding propensities as those of the great bulk of the larvæ of the Moths, and with very much their general appearance. Sawfly larvæ, however, may be readily distinguished from moth larvæ, in the majority of cases, by having either 22, 20 or 18 legs; whereas the greatest number of legs that any moth larva has is 16. The species that we now have to do with

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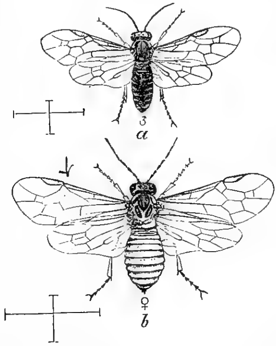
*In the PRACTICAL ENTOMOLOGIST for September, 1866, the Senior Editor published the first complete history of this Insect, as it exists in the United States, and in an Appendix to the Article gave its full scientific synonymy, showing that, in accordance with the Law of Priority, its correct name was *Nematus ventricosus*, Klug, and that, according to Snellen Von Vollenhoven, this was as early as 1859 the received name for the species in Europe. As is stated in that Article, the species was first described by Klug in the year 1819 under the above specific name, and it was not till four years afterwards that St. Fargeau blunderingly described the male under the specific name of *affinis*, and the female under the specific name of *trimaculatus*—thus manufacturing two species out of one! Two years after the above Paper from the pen of the Senior Editor had been published, Dr. Fitch gave to the world an Article on this subject in the *Transactions of the New York State Agricultural Society* for 1867, pp. 909--932 In this Article, though he incidentally remarks (p. 910) that the same insect had been described by another author under the name of *ventricosus*, he yet adopts St. Fargeau's name for it, or rather that one of St. Fargeau's two names which applies exclusively to the female sex—namely "*trimaculatus*." This, however, is a trifling matter; for although Dr. Fitch has frequently busied himself in upsetting old established names, and in accordance with the rigid Law of Priority supplanting those old names by still older ones, which he has chosen to resurrect from the buried dust of ages, we ourselves attach but little importance to this kind of scientific legerdemain. But Dr. Fitch has not been satisfied with adopting St. Fargeau's name published in 1823 in preference to Klug's name published in 1819, thus flying in the face of that very Law of Priority, for which he is generally so great a stickler: he must also adopt St. Fargeau's blunder in giving that name. It will scarcely be believed, but it is positively and absolutely true, that Dr. Fitch describes exclusively the female sex of this insect, and palms it off upon his readers as a description of both sexes! (See pp. 926-7). Yet the males are almost entirely black and the females almost entirely yellow; so that a description that suits the female is altogether inapplicable to the male. Nor is this an unusual thing among the Sawflies; for it was shown by the Senior Editor as long ago as December, 1866, that in this Family the body of the male is very generally much darker than that of the female, while in the *Ichneumon* family it is exactly the reverse. (See *Proc. Ent. Soc., Phil.*, VI, pp. 238-9).

In the Paper in the *Practical Entomologist* which has been already referred to (Vol I, pp. 120-1) it is expressly stated that "the males and females of this Sawfly differ so widely that they would scarcely be taken by the inexperienced entomologist for the same species;" and a very full description of each sex is then and there given. Yet two years subsequently Dr. Fitch, as it appears, was totally unacquainted with the male sex, or at all events his description applies exclusively to the female, and he says not one single word about the sexes. And this when, by his own account, the insect was swarming in his own garden under his very nose! Of course, under these circumstances, it is impossible that he could ever have looked into the Paper on the same subject published two years before in the *Practical Entomologist*. But when an author is careless enough to make such blunders as the above, would he not do well, before he gives his own lucubrations to the world, to see what others have published in the same special department of Natural History?

comes out of the ground soon after the leaves of the currant and gooseberry bushes, upon which it feeds, put forth in the spring, or from

[Fig. 7.]



Colors—Black and yellow.

the latter part of April to the forepart of May. The sexes then couple, and the female proceeds to lay her eggs along the principal veins on the under side of the leaf. From these eggs shortly afterwards hatch out minute green 20-legged larvæ or worms, which at first have black heads and many black dots on their bodies, but after moulting for the last time are entirely of a grass-green color, except the large dark eye spots on each side of the head found in all larvæ belonging to this genus, and except that the joint next the head and the two hindmost joints are of a yellow color, as is also the case in the less mature larva, which bears so many black markings. In the annexed Figure 8, *a*, *a*, *a*, *a* shows larvæ of different sizes in different positions; and *b* gives

[Fig. 8.]

Colors—Green, yellow and black.

an enlarged view of one of the abdominal joints in profile, so as to exhibit the position of the black spots. When full-grown the larvæ are about three-quarters of an inch long, and from their greatly increased size, make their presence readily known by the sudden disappearance of the leaves from the infested bushes. Shortly afterwards, having attained a length of fully three-quarters of an inch, they burrow underground, generally beneath the infested bushes, or, if there are many leaves lying on the ground, simply hide under those leaves. In either case they spin around themselves a thin oval cocoon of brown silk, within which they assume the pupa state. But frequently, as we are assured by Mr. Saunders of Canada West, and as European observers have noticed, they spin their cocoons in the open air upon the bushes. About the last week in June or the first part of July, or occasionally not until the beginning of August, the winged insect bursts forth from the cocoon and emerges to the light of day; when the same process of coupling and laying eggs is repeated. The larvæ hatch out from this second laying of eggs as before, feed on the leaves as before, and spin their cocoons as before; but the perfect fly from this second brood does not come out of the cocoon till the following spring, when the same old series of phenomena is repeated.

From the drawings of the Male and Female Fly given above (Fig. 7), the reader will see at once that the two sexes differ very widely. This is very generally the case among the Sawflies, and it is a remarkable and most suggestive fact that, when this takes place, the body of the male is almost invariably darker than that of the female. Nor does our species, as will be observed at the first glance, form any exception to the rule. Indeed, as with two other Sawflies that devour the foliage of our Pines and Firs (*Lophyrus Abbottii* and *L. abietis*), the body of the male is almost entirely black and that of the female almost entirely yellow; so that at first sight we should suppose the two to belong to different species. Since, from some unaccountable oversight, Dr. Fitch has overlooked this fact, and described both sexes as being colored in the manner which is exclusively to be met with in the female, it will be as well to add here full descriptions, first of the female fly and secondly of the male fly. These descriptions were, indeed, published by the Senior Editor two years before Dr. Fitch's appeared; but the writings of that gentleman circulate so extensively that, when he makes an important mistake such as this, it is proper that it should be corrected in our columns in detail.

FEMALE FLY.—General color of body bright honey-yellow. *Head* black, with all the parts between and below the origin of the antennæ, except the tip of the mandibles, dull honey-yellow. Antennæ brown-black, often tinged with rufous above, except towards the base, and beneath entirely dull rufous except the two basal joints; four-fifths as long as the body, joint 3, when viewed laterally, four times as long as wide, joints 3-5 equal in length, 6-9 very slowly shorter and shorter. In two females the antennæ are 10-jointed, joint 10 slender and ⅔ as long as 9. *Thorax* with the anterior lobe above, a wide stripe on the disk of each lateral lobe which is very rarely reduced to a mere dot, or very rarely the whole of each lateral lobe, a spot at the base and at the tip of the scutel, the two spots sometimes confluent and very rarely subobsolete, a small spot at the outer end of each cenchrus and a geminate small spot transversely arranged between the cenchri, the tip of the metathoracic scutel, the front and hind edge above of what seems the 1st abdominal joint, but is in reality the hind part of the metathorax, or very rarely its whole surface above, and also the whole lower surface of the breast between the front and middle legs, or very rarely two large spots arranged crossways on that surface, all black. Cenchri whitish. *Abdomen* with joints 1 and 2 very rarely edged at tip with black. Sheaths of the ovipositor tipped more or less with black, the surrounding parts sometimes more or less tinged with dusky. The triangular membrane at the base of the abdomen above, whitish. *Legs* bright honey-yellow; all the coxæ and trochanters whitish; the extreme tip of the hind shanks and the whole of the hind tarsi, brown-black. *Wings* glassy; veins and stigma brown-black, the latter as well as the costa obscurely marked with dull honey-yellow. In a single ♀ all three submarginal cross-veins are absent in one wing, and only the basal one is present in the other wing. In another ♀ all three are indistinctly present in one wing, and in the other only the basal one and a rudiment of the terminal one. In a single wing of two other ♀, the terminal submarginal cross-vein is absent. And in a single ♀ there are but three submarginal cells in either wing, precisely as in the genus *Euura*.—Length ♀ 0.22—0.28 inch. Front wing ♀ 0.27—0.33 inch. Expanse of wings ♀ 0.53—0.64 inch, (wings depressed).

MALE FLY.—General color of body black. *Head* with the clypeus and the entire mouth, except the tip of the mandibles, dull honey-yellow. Antennæ brown-black, often more or less tinged with rufous beneath except towards the base: as long as the body, the joints proportioned as in ♀, but the whole antenna, as usual in this sex, vertically much more dilated, so that joint 3 is only 2½ times as long as wide when viewed in profile. *Thorax* with the wing-scales and the entire collare honey-yellow. Cenchri whitish. *Abdomen* with more or less of its sides, the extreme tip above, and its entire inferior surface honey-yellow. *Legs* as in ♀. *Wings* as in ♀. In two ♂ the middle submarginal cross-vein is absent in both wings, so that if captured at large they would naturally be referred to the genus *Euura*. In two other ♂ this is the case in one wing only. Another ♂ has but the basal submarginal cross-vein remaining in each wing. And in two other ♂ the terminal submarginal cross-vein is absent in one wing.—Length ♂ 0.20—0.22 inch. Front wing ♂ 0.23—0.25 inch. Expanse of wings ♂ 0.44—0.51 inch, (wings depressed.)

Described from 22 ♂ and 13 ♀, 3 ♂ and 1 ♀ of the spring brood. The fact of two ♀, contrary to the established character of the genus *Nematus*, having 10-jointed instead of 9-jointed antennæ is a variation of a kind of which no other example in the whole Family of Sawflies is on record. Had such a specimen been captured at large, instead of being bred, along with a lot of normal ♀, from the same lot of larvæ taken from the same lot of bushes, it would probably have been made the basis for a new genus and a new species by some of our genus-grinding closet-entomologists.

The mode in which this Currant Worm has been transmitted, first from the European nursery to the American nursery, and afterwards all over several States of the Union, can be easily explained. As has been stated just now, it usually passes the autumn and winter in the ground under the bushes, where it has fed, housed in a little oval cocoon from ¼ to ⅓ inch long. Hence if, as often happens, infested bushes are taken up in the autumn or early in the spring, with a little dirt adhering to their roots, and sent off to a distance, that dirt will likely enough inclose a cocoon or two. A single pair of cocoons, if they happen to contain individuals of opposite sexes, will be sufficient to start a new colony. The first and probably the second year the larvæ will not be noticed; but increasing, as almost all insects do, unless checked from some extraneous source, in a fearfully rapid geometric progression, by the third or fourth year they will swarm, strip the bushes completely bare of their leaves, and ruin the prospect for a good crop of fruit. Of course, like other winged insects, they can fly from garden to garden in search of a suitable spot whereon to deposit their eggs; so that any point where they have been once imported becomes, in a few years, a new centre of distribution for the immediate neighborhood.

Nurserymen and all others, importing Gooseberry and Currant bushes from a distance, should be particularly careful, before they plant them, *to wash the roots thoroughly in a tub of water, and burn or scald whatever comes off them.* Any cocoons, that may happen to be hidden among the dirt attached to the roots, will then be destroyed. By attending to this precaution the dissemination of this mischievous little pest, throughout the United States, may be greatly retarded for many years to come.

For those who are already cursed with it, the same hellebore which we shall recommend at the end of this Article, as universally efficient against all three kinds of Gooseberry and Currant Worms, is the best, the cheapest and the most available remedy. Where this cannot be conveniently obtained, the Imported Currant Worm, owing to a peculiarity in its habits, can be pretty successfully fought upon a system, which is inapplicable to the other two species on account of the difference in their habits. Unlike the other two, the Imported Currant Worm, as has been already stated, lays its eggs in large groups on the under side of the leaf, and upon the principal veins, as shown at No. 1 in Figure 9, instead of attaching them in comparatively small patches to the twigs and branches. Hence, when the eggs hatch out, the minute little larvæ can find

[Fig. 9.]

plenty of food without wandering off, and they have the habit when very young of boring small holes through the leaf as shown at No. 2 in Figure 9, and when they become a little older, holes that are a little larger as shown at No. 3. It is evident that such holes as these may be readily recognized, and the leaf be carried larvæ and all far away from any currant or gooseberry bushes and left to wither there, or—to make assurance doubly sure—thrown into the fire. If, however, the young larvæ are removed a few rods away from any plant belonging to the botanical genus *Ribes* (Currant and Gooseberry), they will be sure to die of starvation. For they cannot feed on anything else, any more than the common Locust-borer can live on an Apple-tree. As the eggs are laid in such large groups, there will be but a few leaves bearing these newly hatched larvæ to remove from every bush.

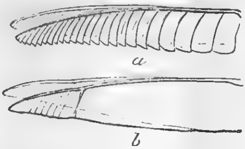
Wherever this Currant Worm has been introduced, there has prevailed from some cause or other a popular superstition, that the currants grown upon the infested bushes are poisonous. This is a mere delusion. They may be, and very probably are, unwholesome, just as any other fruit would be perhaps more or less unwholesome, if grown under such unnatural conditions as to seriously affect the health of the tree; but we have the authority of Dr. Fitch, himself a physician, for believing that the common notion on this subject is entirely erroneous.

Entomologists have often speculated, whether the same parasite will attack several distinct species of insects, and whether any European species, which has been introduced into America without its peculiar parasites, will ever be attacked by the indigenous parasites of this country. So far as regards our Imported Currant Worm, both these questions can be answered in the affirmative. Three years ago the Senior Editor published the fact, that this worm was parasitically infested by the larva of a small Ichneumon-fly (*Brachypterus micropterus*, Say), which has such short and rudimentary wings, that it has very much the appearance of an Ant; and more recently it has been discovered by that excellent observer, J. A. Lintner of Schoharie, N. Y., that the eggs of this Currant Worm Fly are so generally inhabited by the larva of a minute Hymenopterous Parasite, that among fifty eggs he only found four or five which hatched out into Currant Worms.

As these pages were going through the press, we received from the Editor of the *Canadian Entomologist* a third parasite, which he had himself ascertained to prey, not on the egg of the imported Currant Worm Fly, but on the larva. This parasite is a small four-winged fly belonging to the great *Ichneumon* Family, and scarcely one-fifth of an inch long, with its front wings very prettily ornamented each of them with two dusky bands. A full description of it (under the name of *Hemiteles nematıvorus*, n. sp.) will probably appear before long, from the pen of the Senior Editor, in the columns of the excellent Periodical just now referred to. This very same species of *Ichneumon*-fly had been captured near Rock Island, Ill., several years ago by the Senior Editor; and as the Imported Currant Worm has not as yet been introduced into that region, we must conclude that this Ichneumon-fly could not have been imported into America from Europe along with this Currant Worm, but that in all probability it is an indigenous species. Hence we have additional proof that, under certain circumstances, native American parasites can, and actually do, acquire the habit of preying upon European insects when the latter are imported into America. It is certain, however, that they will not do so in all cases without exception; for although the Wheat Midge, or Red Weevil as it is incorrectly termed in the West, invaded our shores some forty or fifty years ago, not a single parasite has yet been discovered to prey upon it in this country, although there are no less than three that prey upon it in Europe.

The Sawfly Family (*Tenthredo*), to which both this and the next species to be noticed belong, derives its name from the "ovipositor" or egg-laying instrument being modified so as to mimick the blade of a saw. Under the microscope—and in the larger species even under a good lens—it will be seen that the lower edge of each of the two horny blades, of which this instrument is composed, is furnished with very fine teeth, the shape of which differs in different species. With this tool the female fly saws into the texture of the leaf or of the twig, in which the instinct of each particular species teaches it to deposit its egg; and—wonderful to relate—it was demonstrated long ago that the eggs thus deposited inside the substance of the plant, which is to supply the future food to the young larva as soon as it hatches out, actually grow and derive nourishment from the sap of that plant, so as often to attain double their original size. Hence we may see at once why the eggs are deposited by this group of insects in such situations as these, and why Nature has provided the female Sawflies with saws in their tails. But—as the thoughtful reader will perhaps have already observed—our Currant Worm Fly lays its eggs upon the surface, and not in the interior, of the leaf, glueing them thereto by some adhesive fluid which it secretes for that purpose. And we may add that there are a few other Sawflies—such for example as the Rosebush Sawfly (*Selandria rosæ*)—which do the very same thing, and consequently, as well as our species, can have no use for any saws at their tails. If, therefore, as was formerly the almost universal belief of the scientific world, each species whether of animals or of plants was independently created, with all its present organs and instincts, and not derived, as is the more modern doctrine, from the gradual modification of pre-existing species through a long series of geological ages, we might naturally expect our Currant Worm Fly, and the Rosebush Sawfly and such few other Sawflies as practice similar modes of laying their eggs, to have no saws at all. For why should nature, when she is creating new species, bestow an instrument upon a particular species which has no occasion whatever to use that instrument? In point of fact, however, all female Sawflies, no matter what their habits may be, possess these saws, though in one genus (*Xyela*) the saws, instead of being hard and horny throughout, are said to be soft and membranous above and below;* and in certain other Sawflies, though they are as hard and horny as usual, they are degraded and—to use the technical term—"defunctionated." This will be seen at once from an inspection of the following drawing (Fig. 10) copied by ourselves from nature and very highly magnified. Here *a* represents the two saws of the female of the Willow-apple Sawfly (*Nematus salicis-pomum*, Walsh), which belongs to the very

[Fig. 10.]



same genus as our Currant Worm Fly. Now, we know that the female of the Willow-apple Sawfly deposits a single egg inside the leaf of the Heart-shaped Willow (*Salix cordata*) about the end of April, probably accompanying the egg by a drop of some peculiar poisonous fluid. Shortly afterwards there gradually develops from the wound a round fleshy gall, about half an inch in diameter, and with a cheek as smooth and as rosy as that of a miniature apple; inside which the larva hatches out and upon the flesh of which it feeds. Of this gall we propose to present a figure to our readers in the next number of our Magazine, in illustration of a Second Article on "Galls and their architects." In this particular case, therefore, as the female Fly requires a complete saw with which to cut into the Willow leaf, nature has supplied her with such saws, as is seen at once from Figure 10, *a*. Now look at Figure 10, *b*, which is an accurate representation under the microscope of the two saws of our Currant Worm Fly. It will be noticed at the very first glance, that although the blade of the saw is there, the teeth of the saw are almost entirely absent.

What, then, are we to make of these and many other such facts? Manifestly the teeth of the saw are in this last species degraded or reduced to almost nothing, because the female Fly, laying her eggs upon the surface of the leaf, and not cutting into the substance of that leaf as does the female of the Willow-apple Sawfly, has no occasion to perform any sawing process. But why, it will be asked, is the blade of the saw there in its normal size and, with the exception of the degradation of the saw-teeth, as completely developed as in the other species, when such a tool can not be necessary for the simple process of glueing an egg on to the surface of a leaf? The modern school of philosophers will reply, that this is so, because the primordial Sawfly, in the dim far-away vista of bygone geological ages, had a complete pair of saws, and our insect is the lineal descendant of that species, slowly and gradually modified through a long series of years, so as to conform more or less to the change in its habits. On the other

* See Westwood's *Introduction*, II, p. 95.

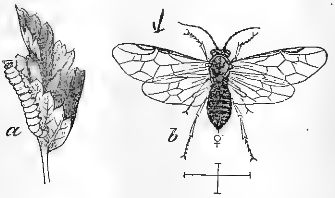
hand the old school of philosophers, who believe that every species was independently created, will argue that this is so, in order to "complete the System of Nature," and "carry out the Plan of the Creation," and "give full and free expression to the Thoughts of the Creator." Possibly this may be the true solution of the difficulty; but—and we say it in no irreverent spirit—what should we think of a Potter, who made all his teacups without exception with handles; those for which handles were required with complete ones such as you could put your finger through, and such cups as were not wanted to have any handles at all, with solid unperforated ones, such as would be nearly useless? And what should we say, if the Potter's friends were to gravely argue, that he took all this unnecessary trouble in order "to complete the System of Art," and "carry out the Plan of the Teadrinker," and "give full and free expression to the Thoughts of the Potter"?

The Native Currant Worm.

(*Pristiphora grossulariæ*, Walsh.)

Like the Imported Currant Worm, this worm produces a Sawfly, which, however, belongs to a different genus (*Pristiphora*), chiefly distinguishable from the other one (*Nematus*) by the front wing lacking what is technically termed the "first submarginal cross-vein." In Figure 11, *b*, we give a magnified drawing of the female of this fly, and if the reader will look at this drawing and compare it with that of the Imported

[Fig. 11.]



Colors—(*a*) green and black; (*b*) black and honey-yellow.

Currant Worm Fly (Fig. 7, *a* and *b*), he will see that there is in each of them but one cell, or "pane" as it might be termed, on the upper edge of the front wing towards its tip. This is technically called "the marginal (or radial) cell." Now let the reader look a second time at these two figures, and he will see that, underneath this "marginal cell," there is a tier of four cells in the one genus (*Nematus*) and a tier of only three cells in the other genus (*Pristiphora*), the first or basal cross-vein being absent or "obsolete" in the latter, so as to leave the first or basal cell extravagantly large. These three or four cells, as they underlie the "marginal cell," are technically known as "the submarginal (or cubital) cells;" and upon the difference in the number and arrangement of these marginal and submarginal cells depends to a considerable extent the generic classification of the Sawflies. For example, in another genus (*Euura*), which is closely allied to the two of which we present drawings, there are, as in the second of these two, one marginal and three submarginal cells; but here it is the *second*, not the *first* (or basal) submarginal cross-vein that is obsolete; so that here it is the *second*, not the *first* (or basal) submarginal cell that is extravagantly large, being formed in this last case by throwing the typical second and third cells into one, and in the other case by throwing the typical first and second cells into one, just as by removing the folding doors two rooms are thrown into one.

Persons who are not familiar with this subject are apt to suppose, that the pattern of the curious network on every fly's wing varies indefinitely in different individuals belonging to the same species. As a general rule, there is scarcely any variation at all in this matter, each species and even each genus having its peculiar pattern, and all the individuals belonging to a particular species having the network of their wings as exactly similar as the different photographs executed by a Daguerreotypist from the same negative plate. You may take, for instance, a thousand honey-bees, and you will find that in the front wing of every one of them there are exactly one marginal and three submarginal cells, which however are all of them shaped very differently from the corresponding cells in any Sawfly, though all the thousand honey-bees will be found to have them shaped exactly alike, cell corresponding to cell, as in any particular issue of $5 Bank notes, vignette corresponds to vignette and medallion die to medallion die. Among the Sawflies, indeed, as was noticed in the description of the Imported Currant Worm Fly, the pattern of the wing-veins in different specimens of the same species varies occasionally a little; but this is the exception and not the rule, and is philosophically of high interest, as showing how one genus may in the course of indefinite ages change gradually into another genus.

The Native Currant Worm Fly differs in another remarkable point from the Imported Currant Worm Fly. The sexes are here almost exactly alike in their coloration, and with the exception of the legs of the male being a little more marked with black than those of the female, it would not be very easy to distinguish one from the other, but by the usual sexual characters. Hence we have not thought it necessary to give a figure of the male as well as of the female; whereas in the imported species the two sexes differ so essentially in their coloration that, as already observed, a figure of one would give scarcely any idea of the other.

The larva of the Native Currant Worm Fly (Fig. 11, *a*) is of a uniform pale green color, without those black dottings which are always found except after the last moult in the imported species. Before the last moult, indeed, the head is of a uniform black color, though it afterwards has a good deal of green in front; but the body remains throughout of the same immaculate green shade. It differs also in its habits from the imported species, never, so far as we can find out, going underground to spin its cocoon, but always spinning that cocoon among the twigs and leaves of the bushes upon which it feeds.

This species agrees with the other one in being double-brooded, the first brood of larvæ appearing about the end of June and the beginning of July, and the second brood from the middle of August to the forepart of September. But instead of the larvæ of the second brood lying underground in their cocoons all winter, they burst forth in the fly state from the beginning to the middle of September. Hence the female fly is compelled to lay her eggs upon the twigs instead of on the leaves; for if she laid them upon the leaves, as is the habit of the imported species, the second laying of eggs, which has to pass the winter in that state, would fall to the ground along with the leaves in the autumn, and the young larvæ would starve when they hatched out next spring before they could find their appropriate food. Consequently, in the case of this species, we cannot apply the method of counterworking the other species which has been already referred to. For we have particularly remarked that the very young larvæ were not gathered in great numbers upon one particular leaf—as with the imported species—but were distributed pretty evenly over the whole bush. Neither did they bore the singular holes through the leaf (Fig. 9), which render the other species so easy of detection when young.

As will have been observed from the figures given above, the Native species, besides the differences already noticed, is only about two-thirds the size of the other in all its states. Like the other, it infests both Currant and Gooseberry bushes, but appears rather to prefer the Gooseberry. Indeed there can be little doubt that our native gooseberries formed its original food-plant; for many years ago we captured a single specimen in the neighborhood of Rock Island, Ill., in woods remote from houses, where the wild gooseberry was pretty abundant, and there was no wild Red Currant. The species was described in 1866 by the Senior Editor* from numerous specimens found stripping the gooseberry and currant bushes in Davenport, Iowa; and it has since been reported to us by Miss Marion Hobart, of Port Byron, N. Ills., as so abundant in her neighborhood in 1868 on the gooseberries as to completely defoliate them three times over, so that she inferred—but we think erroneously—that there were three distinct broods of them, one generated by another. Mr. Jas. H. Parsons, of Franklin, N. Y., has in a letter to us expressed the same opinion with regard to the imported species. Probably both parties have been deceived by what is a very common occurrence with many leaf-feeding larvæ. There is often a warm spell early in the year which causes a moiety of the eggs of a particular brood to hatch out. This is taken for the first brood. Then follows a long series of cold weather, which prevents the other moiety of the same batch of eggs from hatching out till perhaps a month or six weeks afterwards. When at last this moiety does hatch out, it is considered by inexperienced persons as a distinct second brood. There is also very frequently a very great variation, probably from similar causes, in the time at which the same batch of pupæ burst forth into the perfect winged state. For example, out of a lot of 31 cocoons of the second brood of the Imported Currant Fly, all received by us at the same time from Dr. Wm. M. Smith of Manlius, N. Y., most of the flies came out between June 26th and July 11th, but a few did not appear till towards the latter end of July and one lingered on till August 13th.

On Sept. 11th, 1869, we captured a single female of the Native American species at large in the City of Rock Island; but the species has not yet prevailed there to any noticeable extent, so far as we have heard. In August, 1867, A .H. Mills, of Vermont, wrote to us about "a small green worm" infesting the leaves of his Currant bushes, which, as he was well acquainted with the Imported species, was most probably the Native American worm. And as long ago as 1858, a species of Sawfly was described in the

* *Practical Entomologist*, I, pp. 122-4.

Ohio Farmer, by an anonymous correspondent, as infesting the gooseberry and red currant bushes in the vicinity of Cleveland, Ohio. This last species seems to agree in every material respect with our insect, except in going underground to spin up, and in the last brood lying underground in their cocoons all through the winter. Now, we particularly experimented with our species, by counting off a large number of larvæ and putting them into a separate vessel half full of earth; and we found subsequently just as many cocoons attached to the twigs in this vessel as we had put larvæ into the vessel. Hence, if the species ever goes underground to spin up—which is perfectly possible, as there is a similar variation in habits in the Imported Currant Worm—it must be only occasionally. Moreover, we raised fifty-three flies in all (4 ♂, 49 ♀), from larvæ which spun up the last week of August, and none of these flies came out later than Sept. 12th of the same year. Hence—unless the Ohio insect be a distinct species, which we can scarcely believe—we suspect some error in the statements put forth in the *Ohio Farmer*.*

Remedies.

In the case of the multifarious species of Potato Bugs, we showed that different groups must be attacked upon different systems. In the case of the three Currant and Gooseberry worms, that we have here treated of, there is a single remedy which, like Dr. Cureall's Never-failing Pills, is a universal specific. That remedy is powdered White Hellebore, which can be bought at any drug-store at quite a low price. All that is required is to dust it lightly over the infested bushes, taking care to stand to windward during the operation, as if taken into the nostrils it excites violent sneezing. For this purpose, the best plan is to put the powder into a common tin cup, tying a piece of very fine muslin over the mouth of the cup; or the powder may be simply enclosed in a bag of muslin of convenient size. In either case, the apparatus must be fastened to the end of a short stick, so as to avoid coming to too close quarters with it. It is best to select a moderately still day for the operation; as the powder is so exceedingly fine that on a windy day it is apt to get wasted.

To test the genuineness of the article, a very small pinch of it should be applied to the nose. If it is good and has not lost its strength by keeping too long, it will immediately produce a tingling sensation in the nostrils; if it does not produce this effect, it is worthless and should not be used. There is every reason to believe that in those cases where men have used White Hellebore to kill Currant Worms without any perceptible effect, that they had been deceived into buying an adulterated or worthless drug. Although, like almost all our medicines, Hellebore, in large doses, is poisonous, yet in minute doses there is no reason to be afraid of it; for, according to Dr. Fitch, it has long been in use as the basis of those snuffs, which are designed to excite violent and continued sneezing.

We might easily fill two or three columns, and distract the minds of our readers, by enumerating two or three dozen other remedies, which are highly recommended on good authority, and which may, or may not be as efficient as White Hellebore, but we prefer to "let well enough alone."

* The Article in the *Ohio Farmer* appeared in Vol. VII, p. 233, and is supposed by Dr. Fitch—to whom we are indebted for our knowledge of it—to have been written by Dr. J. P. Kirtland. Dr. Fitch, who entirely ignores *Pr. grossulariæ*, Walsh, supposes that the Ohio insect may perhaps be the European species, *Pr. rufipes*, St. Fargeau, which is not known to feed on gooseberry or currant.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 2.

The Hog-caterpillar of the Vine.

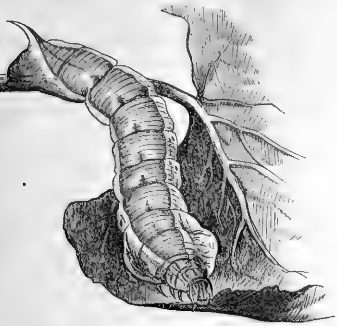
(*Chœrocampa pampinatrix*, Smith & Abbott, alias *Sphinx* [*Darapsa*] *myron*, Cramer, alias *Otus cnotus*, Hübner).*

Of the large, solitary caterpillars that attack the Grape-vine, this is by far the most common and injurious in the Mississippi valley. We have frequently found the egg of this insect glued singly to the underside of a leaf. It is 0.05 inch in diameter, perfectly round, and of a uniform delicate yellowish-green color. The young worm which hatches from it, is pale-green, with a long straight horn at its tail; and after feeding from four to five weeks it acquires its full growth, when it presents the appearance of Figure 12, the horn having become comparatively shorter and acquired a posterior curve.

This worm is readily distinguished from other

*Of the four different generic names under which this species has been classified, "*Sphinx*" is a general term for all the Hawk-moths and refers to the sphinx-like attitude often assumed by their larvæ; "*Chœrocampa*" is derived from two Greek words which mean "Hog-caterpillar;" and "*Darapsa*" and "*Otus*" are gibberish. Of the three different specific names, "*Myron*" refers to an ancient Greek who bore this appellation, "*cnotus*" is pure unadulterated gibberish, and "*pampinatrix*" is from the Latin and signifies "a female vine-pruner." Both Harris and Fitch describe this insect under the name of *Chœrocampa pampinatrix*; and this, as the appellation best known to our grape-growers, and the most characteristic of the habits of the species, we should prefer to retain, although no doubt, according to the strict Law of Priority, the specific name of *Myron* ought to be employed. Mr. Walker, Dr. Clemens and Dr. Morris call this species "*Darapsa Myron*," and Mr. Grote calls it "*Otus Myron*." By ringing the changes with sufficient ingenuity upon the four generic and the three specific names, we may obtain no less than twelve different names for this one insect!

[Fig. 12.]

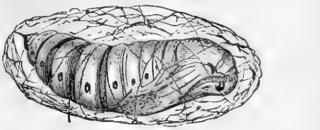


Colors—Pea-green, lilac, and yellow.

grape-feeding species by having the third and fourth rings immensely swollen, while the first and second rings are quite small and retractile. It is from this peculiar appearance of the fore part of the body, which strikingly suggests the fat cheeks and shoulders and small head of a blooded hog, that it may best be known as the Hog-caterpillar of the vine. The color of this worm when full grown is pea-green, and it is wrinkled transversely and covered with numerous pale-yellow dots, placed in irregular transverse rows. An oblique cream-colored lateral band, bordered below with a darker green and most distinct on the middle segments, connects with a cream-colored subdorsal line, which is bordered above with darker green, and which extends from the head to the horn at the tail. There are five and often six somewhat pale yellow triangular patches along the back, each containing a lozenge-shaped lilac-colored spot. The head is small, with yellow granulations, and four perpendicular yellow lines, and the stigmata or spiracles are orange-brown. When about to transform, the color of this worm usually changes to a pinkish-brown, the darker parts being of a beautiful mixture of crimson and brown. Previous to this change of color Mr. J. A. Lintner, of Schoharie, N. Y., has observed the worm to pass its mouth over the entire surface of its body, even to the tip of its horn, covering it with a coating of apparently glutinous matter—the operation lasting about two hours.* Before transforming into the pupa or chrysalis state, it descends from the vine, and within some fallen leaf or under any other rubbish that may be lying on the ground, forms a mesh of strong brown silk, within which it soon changes to a chrysalis (Fig. 13) of a pale, warm

* Proc. Ent. Soc., Phil., III, pp. 663.

[Fig. 13.]

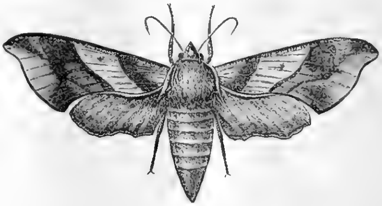


Colors—Yellowish and brown.

yellow, speckled and spotted with brown, but characterized chiefly by the conspicuous dark brown spiracles and broad brown incisures of the three larger abdominal segments.

The moth (Fig. 14) which in time bursts from this chrysalis, has the body and front wings of a fleshy-gray, marked and shaded with olive-

[Fig. 14.]



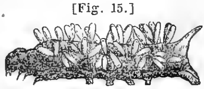
Colors—Gray, olive-green and rust color.

green as in the figure, while the hind wings are of a deep rust-color, with a small shade of gray near their inner angle.

This insect is in northerly regions one-brooded, but towards the south two-brooded, the first worms appearing, in the latitude of St. Louis, during June and July, and giving out the moths about two weeks after they become chrysalids, or from the middle of July to the first of August. The second brood of worms are full grown in September and, passing the winter in the chrysalis state, give out the moths the following May. On one occasion we found at South Pass, Ill., a worm but ½ grown and still feeding as late as October 20th, a circumstance which would lead to the belief that at points where the winters are mild they may even hybernate in the larva state.

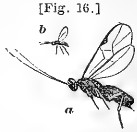
This worm is a most voracious feeder, and a single one will sometimes strip a small vine of its leaves in a few nights. According to Harris it does not even confine its attacks to the leaves, but in its progress from leaf to leaf, stops at every cluster of fruit, and either from stupidity or disappointment, nips off the stalks of the half-grown grapes and allows them to fall to the ground untasted. It is fortunate for the grape-grower therefore that Nature has furnished the ready means to prevent its ever becoming excessively numerous, for in all our entomological experience, we have never known it to swarm in very great numbers. The obvious reason is, that it is so freely attacked by a small parasitic Ichneumon fly—belonging to a genus (*Microgaster*) exceedingly numerous in species—that three out of every four worms that we meet with will generally be found to be thus victimized. The eggs of the parasite are deposited within the body of the worm, while it is yet young, and the young maggots hatching from them feed on the fatty parts of their victim. After the last moult of a worm that has been thus attacked, numerous little heads may be seen gradually pushing through different parts of its body; and as soon as they have worked themselves so far out that they are held only by the last joint of the body, they commence forming their small snow-white cocoons, which stand on ends and present the appearance of Figure 15. In about a week the fly (Fig. 16, *a*, magnified; *b*, natural size), pushes open a little lid which it had previously cut with its jaws, and soars away to fulfil its mission. It is one of those remarkable and not easily explained facts, which often confront the student of Nature, that, while one of these Hog-caterpillars in its normal and healthy condition may be starved to death in two or three days, another that is writhing with its body full of parasites will live without food for as many weeks. Indeed we have known one to rest for three weeks without food in a semi-paralyzed condition, and after the parasitic flies had all escaped from their cocoons, it would rouse itself and make a desperate effort to regain strength by nibbling at a leaf which was offered to it. But all worms thus attacked succumb in the end, and we cannot conclude this article to better advantage than by reminding the Grape-grower, that he should let alone all such as are found to be covered with the white cocoons we have illustrated, and not, as has been often done, destroy them under the false impression that the cocoons are the eggs of the worm.

[Fig. 15.]



Color—White.

[Fig. 16.]



Color—Black.

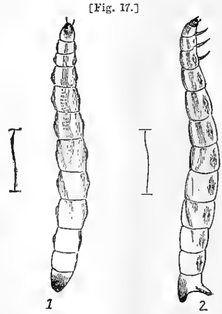
To our Subscribers in Canada.—Parties in Canada, who wish to subscribe for the American Entomologist, can obtain it, postage free, by remitting $2.00 to the Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.

ANSWERS TO CORRESPONDENTS.

Notice.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain, whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

Striped Cucumber Beetle—*M. M. Gray, Cardington, Ohio.*—We quote your letter in full, as it well describes the larva about which you desire information:

[Fig. 17.]

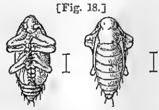


Color—Whitish.

I inclose a specimen of bug which we call the Cucumber or Squash bug, and also a small worm or larva which has destroyed many of my melon and cucumber vines. My object in part is to learn if this worm or larva is the product of the bug or something different and foreign to it. In the early part of the season the small striped bug commenced working on my vines, and they began to wilt and die. I used sulphur and plaster, quassia, tobacco, etc., to prevent or check their ravages, but with little effect. Finally I hunted out and killed a good many, and shortly they seemed to disappear, and my vines began to revive and grow. About three weeks later the vines began to wilt and die worse than before! But this time there were no bugs to be found. Upon examination of the roots, however, I discovered this little white-worm with a black head, from 1-16th to 1-4th of an inch in length, eating into and perforating the root and vine; and as the vines they infested the most were the same that the bugs preyed upon the worst, I conjectured there must be some relation between them.

The larva referred to which attacks the roots, and of which we present highly magnified figures (Fig. 17, 1, dorsal view, 2 side view), is in reality the young of the very same Striped Cucumber Beetle (*Diabrotica vittata*, Fig. 19), which is so injurious to the leaves; for we have ourselves bred the beetle from this larva, and in 1865 Dr. H. Shimer, of Mt. Carroll, Ill., first published an account of its transformations.* After boring into and around the roots for upwards of a month, the larvæ enter the surrounding earth, and within a smooth oval cavity soon change to pupæ (Fig. 18, 1, ventral view; 2, dorsal view), which are transformed to beetles about two weeks afterwards. There are two or three broods during the year. By getting rid of the beetles in the early part of the season, you of course prevent the injuries of the larva, and the most effective agents for this purpose, or at least those in which we have the most confidence, are Paris green and white hellebore. This insect has been very injurious the present year.

[Fig. 18.]



Color—Whitish.

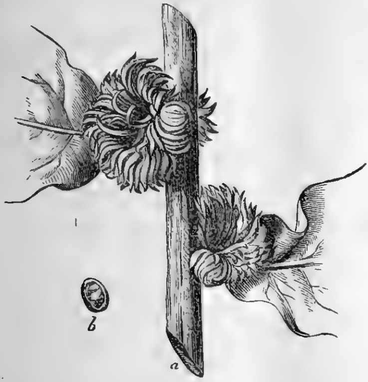
[Fig. 19.]

Colors—Black and yellow.

* *Prairie Farmer*, Aug. 12, 1865.

Leafy Oak-gall—*B. H. B., Pickens' Sta., Miss.*—The cone-like leafy oak-gall which you send, and which we herewith illustrate (Fig. 20, *a*), is apparently the

[Fig. 20.]



Color—Green.

gall named *Quercus frondosa* by Bassett, meaning literally "full of green leaves." You do not mention the kind of oak on which it occurred, but from the fact that Mr. Bassett described his as occurring on the Chinquapin, yours might have been taken from this species, though we have found the same gall both on White and on Bur Oak. This gall is developed after the summer growth of the tree is completed, and the axillary bud, which otherwise would not burst till the spring following, is made, by the puncture of the gall-fly, to develop prematurely in the singular manner illustrated above. The cell (Fig. 20, *b*, section showing larva) containing the larva is half immersed in the apex of the cone, and though the perfect fly is unknown, the character of the larva indicates it to be *Cynipidous*. (See article on Galls, Vol. I, No. 6.)

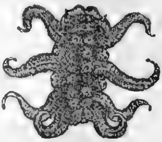
Drop of Gold—*B. H. B., Pickens' Sta., Miss.*—The "drop of gold in shape of a French loaf" attached to a leaf of the Shellbark-Hickory, is in reality the vacated egg-shell of some large moth, and not improbably of that large species which produces the Royal Horned Caterpillar. The smooth short-oval eggs of the same large Stinking Bug, which we figured on page 12 of our first Volume (*Metapodius nasalus*, Fig. 6, *b*), have, even when vacated by the young bug, just the same lustre of burnished gold. In July, 1868, at Lacon, Ill., we found a row of nine of these eggs, all arranged in regular order, like the beads of a necklace, upon a leaf of White Pine; and from these eggs we subsequently hatched out the young bugs.

The Luna Moth—*Geo. W. Kinney, Snow Hill, Mo.*—The immense green moth with an eye-spot in each wing and with each of the hind wings prolonged into a tail, is the Luna Moth (*Attacus luna*, Linn.) The specimen was ♀ and we were glad to get the eggs which she had deposited. The larva feeds on Walnut and Hickory.

T. W. Hoyt, Jr.—The large pale green swallow-tail moth which you describe is the Luna Moth referred to above.

Hag-moth Larva—*Dr. C. T. Farrell, South Pass, Ill.*—The curious brown slug-like larva found on Siberian Crab, of which a better idea can be formed by the accompanying illustration (Fig. 21) than by any descriptive words of ours, is the larva of the Hag-moth (*Limacodes pithecium*, Sm. & Abb.) When received, it had already moulted its long fleshy appendages and attached them to the outside of its round compact cocoon, and ten days subsequently the moth made its appearance. This moth is of a dusky brown color, the front wings variegated with light yellowish-brown. In the Northeastern States this insect is supposed to be single-brooded, but in your latitude it is probably double-brooded. The "spider-like animal" on Blackberries is the pupa of the Many-banded Robber (*Harpactor cinctus*, Fabr., see Vol. I, Fig. 44.)

[Fig. 21.]



Color—Brown.

M. B. Baldwin, Elgin, Ill.—The specimen you found on a spear of grass, and from which you detached, in handling, some of the appendages, is the same Hag-moth larva. At the time you found it, it was evidently in search of some cozy nook in which to form its cocoon, for it had already commenced the operation when it reached us, and the species has never been known to feed on grass.

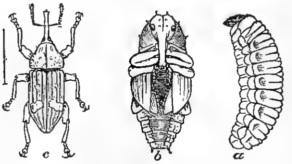
Stinging Bug—*J. M. Shaffer, Fairfield, Iowa.*—The singular craggy-looking bug, about 0.38 inch long, of a yellowish color variegated with brown, with the legs green and a transverse deep-brown band running superiorly across from one side to the other of the dilated abdomen, is *Phymata erosa*, Linn. The genus is characterized by the immensely swollen front thighs, and by the last joint of the antennæ being also swollen, this last character being a remarkable one, as Amyot and Serville well remark, in bugs of such carnivorous propensities. Your statement that one of these bugs stung you severely, does not greatly surprise us, though we never heard of their stinging before, and have handled hundreds of them with impunity. The stinging was of course done by the beak, which is 3-jointed and somewhat resembles that of *Harpactor cinctus*, Fabr. (Vol. I, Fig, 44, *b*.) The plant upon which you found these bugs we take to be *Parthenium integrifolium*, and Mr. A. Fender, of Allenton, Mo., is of the same opinion. We have noticed them ourselves in the latter part of the summer lying quietly in wait for their prey upon a great variety of wild flowers, but mostly on such as like themselves are of a yellowish color so as to conceal them from view. We have also often seen this Bug with its beak inserted into a small bee or a small wasp, which it is wide awake enough to hold at arm's length with its prehensile front legs, so that the poor unfortunate captive has no chance to sting it.

Pear-tree worms—*B. Hathaway, Little Prairie Ronde, Mich.*—The worms found on pear-tree leaves are the same Red-humped Prominent noticed in the answer to D. W. Kauffman of Des Moines, Iowa.

"Dobson"—*Fisherman.*—We cannot tell without seeing specimens, what it is that the disciples of the "gentle art" call "Dobson." It may be the larva either of some May-fly (*Ephemera*), or of some Dragon-fly (*Libellula*), or of a dozen other insects.

White Pine Weevil—*A. S. Fuller, Ridgewood, N. J.*—The borers which have been attacking the leading shoots of your Pines, gradually spreading to the branches, have produced the perfect beetle since their receipt, and as we anticipated, they turn out to be the White Pine Weevil (*Pissodes strobi*, Peck.) At Figure

[Fig. 22.]



Colors—(*a* and *b*) whitish; (*c*) rust-brown and white.

22 it is illustrated in its three stages of larva (*a*), pupa (*b*), and beetle (*c*). We have not known this insect to occur in the West, but it has long been known to be common in the Eastern States. The only practical way of counter-working the injurious work of this weevil, is to cut off the infested shoots and consign them to the flames, while they yet contain the larvæ and before the beetles have escaped. Dr. Fitch,* under the impression that most of the beetles are perfected in the spring, recommends that this work be done in August and September; but as all the beetles had issued from the shoots you sent, by the end of August, we should advise you, so as to be on the safe side, to do such work in July.

* Trans. N. Y. State Agr. Soc. 1857, p. 735.

Unnatural Secretion of Wax—*F. Brewer, Waynesville, Mo.*—The honey bee which has such a profuse waxy formation exuding apparently from the rings of the abdomen, and which you took alive from the entrance of one of your hives, presents a very unusual appearance, and a most remarkable case of wax formation. Mr. J. T. Langstroth, to whom we sent the specimen, suggests that the bee "had a kind of wax dropsy!" The specimen is interesting, and beautifully illustrates the manner in which the ordinary wax of our hives is secreted from the belly of the worker bee, as explained by Hübner, Reaumur, and other writers on the subject.

Raspberry Borer—*F. A. Gates, Massillon, Iowa.*—The borer you describe as having nearly ruined your patch of raspberry bushes, is apparently the common Blackberry and Raspberry borer (*Oberea perspicillata*, Hald.) which in the perfect state is a beetle. The large ochre-yellow moth, with a conspicuous white spot on the front wings, and each of the wings tinged with purple and crossed near the tip by a purplish line, which moth had deposited a large number of eggs on one of the raspberry leaves, was not, as you inferred, the parent of the borer. It is the Senatorial Dryocampa (*Dryocampa senatoria*, Fabr.) The young worms hatching from those eggs would have fed upon the leaves, though the more common food-plant of the species is Oak.

Cocoon of Horn-bug—*A. R. McClutchen, Lafayette, Ga.*—The egg-shaped cocoon formed of excrement and rotten wood glued together, contained the large white larva of some Horn-bug, probably *Lucanus dama*, Fabr.]

Insects named.—*J. R. Muhleman, Woodburn, Ills.*—The moth, with the front wings variegated with light and dark brown, with a conspicuous dark zigzag line running across the outer third, and with the hind wings of a lustrous coppery reddish brown, is the Pyramidal Amphipyra (*Amphipyra pyramidoides*, Guen). You say you bred it from a grape-feeding larva

[Fig. 23.]

Colors—Light and dark Brown.

like the one illustrated on page 225 (Fig. 163). We have also the present summer bred the same species of moth from a similar larva feeding on Red Bud, and have found the larva on the Poplar, which makes three distinct plants that it is known to attack. The specific name of the moth probably refers to the pyramidal hump on the 11th segment of the larva. You say you "recollect a similar larva in Europe on apricots, prune trees, etc., producing an analogous moth." Not at all unlikely, for there is a very similar worm common to the whole of Europe, and which feeds on Oak, Willow and Elm, as well as on fruit trees, and produces a very closely allied moth, the *Amphypyra pyramidea* of Linnæus. The other moth of which you send a pencil sketch, and which is of a uniform deep brown, with two oblique white lines running—the inner line entirely, and the outer one but partially—across the fore wings, is *Agnomonia anilis* of Drury, who states that the caterpillar is violet-white with longitudinal rose-colored lines and an elevated brown ridge across segments 4 and 11, and that it feeds on plants of the genus *Chironia*. The chrysalis is enclosed within a few leaves and is covered with a rosy efflorescence. The other pencil figure which you send seems to represent *Limacodes cippus*, Fabr. (See Harris, Inj. Ins., p. 420).

Cecropia Moth Caterpillar—*H. G. Lewelling, High Hill, Mo.*—The gigantic green caterpillar, covered with beautiful yellow, blue and coral-red tubercles, which you find on the leaves of an apple tree, is the larva of the Cecropia Moth (*Attacus cecropia*, Linn.) It is an immense feeder, and we have known it to be so abundant as to greatly injure young Apple and Soft Maple trees, but its occurrence in very large numbers is extremely rare. We shall figure this caterpillar in a future number.

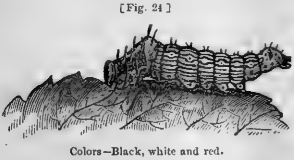
Saml. H. I. Green, Elkart City, Ill.—The large worm found by you descending from an apple tree is the same as the above.

How Cut-worms originate—*Thos. W. Gordon, Georgetown, Ohio.*—You ask how our common cut-worms originate. They are produced from eggs deposited by obscure colored owlet moths belonging to several different genera, and for fuller information on the subject we refer you to the First Annual Report of the Junior Editor, where the history of twelve different species is detailed.

Red-humped Caterpillars on Apple and Pear—*D. W. Kauffman, Des Moines, Iowa.*—What you are irreverently pleased to term "a lot of ugly disgusting worms," but what we consider as one of the most gorgeously dressed caterpillars that God has created, is known as the "Red-humped Prominent" and produces a brownish yellow moth, called in English "the Trim Prominent" (scientifically *Notodonta concinna*). Do pray, Mr. Kauffman, for the future take a careful look at the wonderful Works of the Great Author of Nature, before you again slander and malign them, and call that "ugly and disgusting" which is in reality a perfect gem of insect beauty. Look at the brilliant coral-red head of your larva, and the hump on the middle of its back of the same lovely color! Did you ever see a string of coral beads, on the fair white neck of a young lady, show to greater perfection than do these bright red parts, among the delicate black, yellow and white lines traced lengthways by the finger of Almighty God along the rest of its body? Surely such artistically arranged colors can not be "disgusting" to any properly trained eye! But these worms are "ugly" forsooth! They are at most only about 1¼ inch long—they have no sting—no irritating hairs or prickles such as have the larvæ of a very few of our rarer moths—and they will not even bite, however much you may please to irritate and torment them. Surely a grown man ought not to fancy that so harmless a creature as this is hateful or formidable! But they ate all the leaves off one of your young pear-trees! Very well! They had just as good a right to do so as you have to sit down to your dinner, consuming vegetables and fruits that would otherwise have fed a host of beautiful creations which the vulgar denominate "bugs." God made this lovely green world for the pleasure and benefit not of man alone, but of the multitudinous hosts of the inferior animals. True, we have a right to destroy these inferior animals, when they interfere with our wants and wishes; and so we have a right to take the life even of our brother man, when our own life, and even in certain cases when our property merely, is jeoparded by him. "Kill and be killed" is the great law of Nature, from one end of the Animal Kingdom to the other. But when we are compelled to kill, let us always do it in a merciful and not in a wanton and cruel spirit; and especially, even when we are obliged in self-defence, or for purely scientific purposes, to take the life of some of these little miracles of perfection that the poet calls "winged flowers," let us not add insult to injury and slander them as "disgusting," when even Solomon in all his glory was not arrayed like the very meanest of them!

The Red-humped Prominent—of which we herewith represent the three stages (Figs. 24 larva; 25 pupa, and

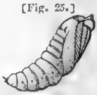
[Fig. 24]



Colors—Black, white and red.

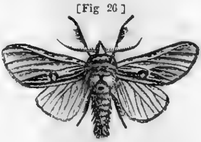
26 moth)—has hitherto been found only on rose, thorn, cherry, plum and apple, and especially on the last. Your finding it on pear, which is very closely allied to the apple, and yet is inimical to the life of several insects commonly found on apple, is a new fact. The species is not very common in the Valley of the Mississippi; but when it does occur, it occurs in great numbers, because the mother-moth deposits a very large number of eggs upon a single leaf. As these larvæ are gregarious throughout their entire existence, and do not scatter over the whole tree, as do many others that occur on our fruit trees—some of which wander off from the very earliest stage in their larval life, and others, as for example the common Tent Caterpillar (*Clisiocampa americana*), only toward the latter part of their existence in the larval state—they can always be easily destroyed. For ourselves, we never feel the least fear or scruple at crushing hundreds of any of these caterpillars in our naked hands; any one, however, that is more nice than we are can put on a pair of stout buckskin gloves before he commences the squashing process. But although we do not hesitate to squash any kind of caterpillar bare-handed, we by no means advise any one to try this operation, either upon the Colorado Potato Bug or upon any of the Blister-beetles. For all these last-named insects are more or less poisonous, and we have known a young girl make her hands very sore by crushing with her naked fingers a lot of the Ash-gray Blister-beetles, that were infesting some English beans.

[Fig. 25.]



Color—Brown.

[Fig 26]



Color—Brownish-yellow.

Insects named—*T. W. G., Georgetown, Ohio.*—The yellowish-green worm with an immense reddish-brown head with two yellow spots upon it, is the larva of the Tityrus Skipper (*Eudamus tityrus*, Fabr.) a brown butterfly with a semi-transparent yellow band across the front wings, and the hind wings each produced into a short rounded tail behind. This worm is most commonly found on Honey Locust, though it also feeds on the common Black Locust, on the Wistaria and on the False Indigo, (*Amorpha fruticosa*.) The dusky-brown tree-hopper with a long yellow spot each side and a horn-like projection from the fore part of its body is the Two-spotted Tree-hopper (*Thelia bimaculata*, Fabr.) which likewise occurs on Locust. The pale yellow and black worms all huddled together on the leaf of a Grapevine are the larva of the American Procris (*Procris Americana*, Boisd.) If you have Harris's work on Injurious Insects you can find in it figures of all three of these species.

Gold Gilt-beetle—*Dr. W. H. Martin, Pinckney, Mich.*—The brilliant beetle, resplendent in a full suit of green and gold and about half an inch long, which you find devouring the leaves of the common Dogsbane (*Apocynum androsæmifolium*), is the Gilt Gold-beetle (*Chrysochus auratus*). It is very common everywhere in the West upon this plant in the perfect beetle state, but as its larva is never met with there, it most probably during the larval state feeds underground upon the roots either of this or of some other plant. Your finding the beetle upon another species of the same genus of plants (*Ap. cannabinum*) is, we believe, a new fact.

The Trumpet Grape-gall—*D. McClaine, Piermont, N. Y.*—The reddish-brown, elongate-conical galls about one-third of an inch long, growing in considerable numbers from the leaf of a wild grape-vine, and which we represent at Figure 27, have long been

[Fig. 27]

Color—Crimson.

known to us, and are described in our manuscripts under the name of the Trumpet Grape-gall (*Vitis lituus*). Like the other three grape-galls which we have figured, one of them in number 12 and the other two in number 6 of our first Volume, (pages 106, 107 and 247,) it is made by a Gall-gnat (*Cecidomyia*)—thus further exemplifying the truth of the general law, that when one species of any particular gall-making genus of insects is found to inhabit a particular genus of plants, many more species of the same gall-making genus can generally be met with on the same genus of plants. Specimens of this same Trumpet Grape-gall, said to occur on the Isabella grape-vine, were received by us three years ago from J. H. Foster, of Pennsylvania, as noticed in the *Practical Entomologist*, I. p. 101. We have seen very similar galls on a wild grape which we took for the Frost Grape (*V. cordifolia*). Two years ago, a very similar kind of gall, said to grow on the "Texas Mustang Grape-vine," were received by us from M. W. Phillips, of Mississippi. These last, however, differed in being green (not brown), and in growing in bunches of three or four (not promiscuously) on the leaf. (See *Pract. Entom.* II. p. 102). Several galls resembling yours and made like yours by Gall-gnats, one of which has been described by Osten Sacken as the Blood-red Hickory Gall (*Sanguinolenta*), and is of nearly the same crimson color as the Trumpet Grape-gall, occur on the leaves of different species of Hickory; and we are acquainted with two such galls that grow on Hackberry leaves.

Grape-berry Moth—*H. C. Barnard, M. D., Charleston, Ill.*—The worms which you sent, and which are injuring your grapes by boring into the berries, are the larvæ of the Grape-berry Moth (*Penthina vitivorana*, Pack.) of which we gave an illustrated account, with suggestions for its prevention, in our first volume, pp. 177–9.

Oak Pruner—*T. J. Plumb, Madison, Wis.*—Your insect is the common Oak Pruner (*Elaphidion putator*, Peck), of which you will find an account in Harris's Treatise on Injurious Insects, p. 98.

Potato Bugs—*Wm. R. Shelmire, Toughkinamon, Pa.*—The blister-beetle which infests your potatoes so grievously and also your tomato vines, is, as you suppose, the very same Striped Blister-beetle (*Lytta vittata*) which we gave an account of in No. 2 of our 1st volume, page 24, where a figure of the insect will be found. In Central Illinois, in the year 1868, we heard of an entire field of potatoes being utterly destroyed by this species in a single day. The tomato being so closely allied to the potato, it is not at all strange that you find this little pest to like it about as well as the potato, seeing that most of the Blister-beetles are pretty miscellaneous feeders. Your statement that it prefers other varieties of potato to the Mercer, or Neshannock as we call it out West, corresponds with the fact which we published in the passage just now referred to, namely, that it prefers other varieties of potato to the Peachblow. It would be a curious enquiry which of the two it would take, if it were absolutely restricted to Mercers and Peachblows. The only approved remedy against all the different kinds of potato-eating Blister-beetles, which are no less than five in number—namely, the Striped, the Ash-gray, the Black-rat, the Black, and the Margined Blister-beetle—is to drive them to leeward with brush into some dry hay or straw previously prepared for their reception, and then to set fire to the dry stuff and burn them all up.

The whitish 16-legged larva, nearly an inch in length and with its head and the first ring of its body mahogany brown, which you found burrowing in a potato stalk, is unknown to us. All that we can at present say is, that it would have produced some kind of moth if it had lived to maturity. As you suggest, it is quite different from the common Stalk Borer infesting the potato, which we figured and described on page 22 of our first volume, this last larva being distinctly striped lengthwise with black. If you had packed this larva of yours according to our printed directions, in a small tight tin box along with a little of its natural food, it would have doubtless reached us in good health, and we could have probably bred it sooner or later to the moth state. As it was, you packed it along with a small morsel of potato stalk and a very large allowance of cotton wool, in a pasteboard box. Consequently, long before the three days expired, which it takes Uncle Sam to travel from Pennsylvania to Illinois, the poor unfortunate larva had perished, partly of starvation but principally of drought. If you had replaced the cotton wool by pieces of potato stalks, retaining the pasteboard box, the insect might perhaps have reached us alive; but the cotton wool effectually did its business. You might as well pack a trout in dry sand and expect it to live and flourish, as pack the inhabitant of a juicy potato stalk in dry cotton wool, and believe that it will not give up the ghost in a very short time.

Blood-sucking Cone-nose—*G. W. C., Alton, Ill.*—Yes, the bug which by its "bite" caused your nephew's arm to swell so badly, is the above insect, which was figured in AMERICAN ENTOMOLOGIST, Vol. I. p. 88, (Fig. 74.) The fact that for a year after the bite the child's arm would swell in the same place, whenever he was unwell, is singular. Your observations about the perfect winged Bug preying on the common Bed-bug are new, but corroborate our inference that, in the larval and pupal states, this species probably sucks the juices of other insects.

Wooly slug-like worm on Apple—*H. A. Green, Atco, N. J.*—The slug-like worm found on a young apple tree, and which is covered above with thickly set, long, but evenly shorn light-brown hairs, these hairs generally meeting and forming a sort of ridge along the back and along each side, is the larva of the Rabbit Moth (*Lagoa opercularis*, Sm. and Abb.) This moth is cream-colored with thick wooly body and legs, and with the basal portion of its front wings covered with curly wool which is marked more or less with rusty black. The generic name which comes from the Greek, signifies of, or belonging to, a rabbit, and was given by Dr. Harris on account of the short, squat form and smooth fur of the larva. The species is not likely to be troublesome, for it has long been considered a rare insect; though we received it last year from a correspondent in the East, who stated that he had met with it in very considerable numbers on one of his apple-trees.

And now Mr. Green, you deserve a good scolding! As often as we have remonstrated against sending insects folded loose in a letter, you persist in committing the same offense. Here is a choice and rare larva, which we should have been much pleased to have reared, and you send it all the way from New Jersey to St. Louis, folded loose in a letter, in the vain hope that it would reach us alive. Well, by some miracle or other it was not entirely squelched by Uncle Sam's canceling stamps, but it had been so effectually squeezed in the mail bags that life was past recovery. And when we ponder, Sir, over the torture and lingering death which you caused the poor creature by your careless packing, we feel strongly inclined to report you to the "Society for the Prevention of Cruelty to Animals" and have you suffer the highest penalty of the law. The only way we can think of, for you to exonerate yourself from prosecution for such a heinous crime, is to bribe us to keep "mum" by sending us another specimen properly packed!

✓ **A Water-Bug.**—*W. V. Smith, Brooklyn, N. Y.*—The brown-colored and very slender Bug, almost three inches long, including the slender bristle-like tail that projects from its hinder extremity, and with long slender legs, is the *Ranatra fusca* of Beauvois. An almost exactly identical species occurs in Europe, which is known as *Ranatra linearis*. This insect belongs to the same *Nepa* Family of the Half-winged Bugs (*Heteroptera*) as the Gigantic Belostoma, of which we gave a figure on page 249 of our last number. This entire Family inhabits the water, though they are all provided with wings by means of which they are enabled to fly from pond to pond; and they are all of them Cannibals, their front legs being metamorphosed into arms to seize their prey with. Your insect is very common out West in shallow sluggish pieces of water. We have never met with any in running brooks, which, as you say, is the situation in which your specimen was found.

Goldenrod Galls—*G. W. C., Alton, Ill.*—The round, pithy galls which you find on the stems of the Goldenrod (Solidago,) each containing a maggot in the centre, are formed by a two-winged fly *Trypeta* (*Acinia*) *solidaginis*, Fitch. The "bushy bunch of leaves" at the extremity of the same plant is, as you rightly suppose, a gall; but it is made by a Gall-gnat (*Cecidomyia solidaginis*, Lœw), and not by the same Gall-fly which produces the round gall.

Oak-leaf Gall—*B. H. Broadnox, Pickens' Sta., Miss.*—You send us a spherical but somewhat depressed gall on the leaf of the Black Jack Oak (*Quercus nigra*), about the size of a small pea, but several of them often running together into an irregular mass; its under surface pale green and flattened, with a central nipple, its upper surface dark blood-red or crimson, much rounded, and often divided by slender grooves into from 12 to 20 four-five-or six-sided compartments, like the back of a tortoise. This gall was described in 1864 under the name of the Oak-pill Gall (*Q. pilulæ*) by the Senior Editor. The specimens you sent contained the larva of a Gall-fly (*Cynips*), and the Senior Editor, from the fact of his having actually bred certain Guest Gall-flies from this gall, when he published his description, supposed the gall to be the work of some unknown gall-making Gall-fly. Subsequently, however, he became aware that the real gall-maker was not a Gall-fly (*Cynips*), but a Gall-gnat (*Cecidomyia*), and that the very same gall had been briefly described, but not named, by Osten Sacken in the year 1862 as the production of a Gall-gnat. Up to this period this was the first published case of a Gall-fly living as a guest in a gall made by a Gall-gnat; but several other such cases have since been discovered. The true gall-making larva of this Oak-pill Gall, which larva, as already stated, produces not a Gall-fly, but a Gall-gnat, is orange-colored, with a very small pointed head and a clove-shaped "breast-bone;" (see our figure 86 *a*, Vol. I, No. 6;) on the other hand, the larva of the Gall-fly that inhabits this gall as a guest is whitish, sometimes with a dark stomach, and has a large round whitish head with long robust horny black jaws, which in the living insect may often be seen to open and shut in a vicious manner. The former does not develop to its full size till about the time of the fall of the leaf; when it leaves the gall and is supposed to go under ground and come out the next summer in the perfect fly state, ready to deposit its eggs upon the next year's crop of oak-leaves. On the other hand, the larva of the Guest Gall-fly does not leave this gall till it assumes the perfect or winged state.

Hitherto, this gall has only been met with upon Black Oak (*Q. tinctoria*), and Red Oak (*Q. rubra*), upon which trees in certain seasons it swarms so prodigiously, that almost every leaf bears at least half a dozen of them, and some leaves are studded all over with them. Your finding it upon the Black Jack Oak is a new fact, but it is quite in accordance with the general rule, because that Oak belongs to the same great group of the genus *Quercus* as the Red and Black Oaks, and because there is no known Oak-gall that occurs indiscriminately upon certain species belonging to the White Oak group and upon certain other species belonging to the group of the Red and Black Oaks. Botanically, these two groups of Oaks differ in this very notable character, that while it requires two years to perfect the acorn of the Red and Black Oak group, the acorn of the White Oak group is perfected from the blossom in a single season. There is a very closely allied gall, the Symmetrical Oak-leaf Gall of Osten Sacken, also produced by a Gall-gnat, which scarcely differs from yours except in the lower surface being as much rounded and of the same crimson color as the upper surface. It is very satisfactory that this gall also occurs on a species belonging to the Red and Black Oaks—namely, the Spanish Oak (*Q. falcata*).

Humble Bees—*Charles S. Davis, Decatur, Ill.*—There are about fifty distinct species of Bumble or Humble Bees found in North America, of which rather more than half the number occur in the United States, including our new possessions in Alaska. In the immediate neighborhood of Rock Island we have taken about ten different species. The species differ notably in the amount of yellow markings, but have all of them the same general appearance; they differ also in size.

As with all other social insects, there are three distinct forms in every species of Humble Bee, like the drones (or males), the queens (or perfectly fertile females) and the workers (or partially fertile females) among the honey-bees. Among the Humble-bees, it is only the queens or large females that live through the winter and start fresh nests in the spring; the workers or small females always die in the fall. These last, for the most part, only differ from the queens in being about two-thirds their size. It is the queens alone that are seen in early spring flying round apple blossoms, etc., the workers not being born till later in the year.

The specimens you send are genuine Humble-bees—workers—and belong all of them to our commonest species in the U. S., the Pennsylvania Humble-bee (*Bombus pennsylvanicus*. De Geer). This kind makes its nest in the ground; and there were probably several of their nests in your hay-field, which your hay-making operations disturbed. Hence they attacked your teams, as a hive of honey-bees will fight if you disturb them. You state yourself that they troubled you a good deal while making hay, and say nothing about their disturbing your teams at any other time or in any other place. No doubt if you had let them alone, they would have let you and your horses alone. You must not blame them for fighting for their families. We presume you would do the same if our Indian friends were to make an onslaught upon your household gods.

With the exception of a few solitary bees (belonging to the genera *Halictus* and *Andrena*), which are known as "Sweat-bees," and having a taste for human sweat often get under folks's shirts in the hot summer weather and sting if roughly handled, there is no kind of Bee or Wasp that does not let man severely alone, if man will be good enough to do the same by him. And what is true of man, is equally true of the different animals domesticated by man.

As with all Bees and Wasps, including the Honey-bee, the males of all the Humble-bees have got no sting at all. In the case of certain species, the male Humble-bee haunts flowers for the sake of the honey and pollen found therein; in the case of other species, they fly idly about till they die of starvation, as we have observed to be the practice of the male of your species. In no case, however, does any male Humble-bee, or indeed any male Bee or Wasp belonging to any species, gather up provisions for the nest. Like the red Indians, the males are too chivalrous to work themselves, and it is upon the females that all the labor of providing for the family devolves.

Insects for sale—*H. M. G., Chicago, Ill.*—Yes, we understand that the extensive collection of N. A. Lepidoptera, belonging to Mr. Geo. M. Peck, is for sale as a whole, or in part. It has been represented to us as being one of the finest private collections in the country. Mr. Peck's address is 129 Maiden Lane, New York.

Can Land be insured against Cut-worms and other Insects?—*A. Willis, Columbia, Mo.*—In answer to your queries, we regret to say that we know of no kind of preparation which you can apply to your clover land, so as to insure the nursery stock you intend planting upon it next spring, against the depredations of insects. The habits of these lilliputian foes are so diverse, and we have to fight them in so many different ways, that it is impossible to apply any particular remedy or preventive that will affect them all. We think that the best thing you can do, is to keep the land plowed clean until you wish to use it. It was formerly supposed that a clean summer and fall fallow would insure the crops planted the following spring, against the attacks of Cut-worms. But since we have shown that some of these worms, which are so injurious in May and June, are produced from eggs deposited the same spring,* and that all Cut-worms do not hatch the year before they attain their growth, it follows that this clean fallow will be but a partial prevention of their attacks.

* See Missouri Ent. Rep., pp. 72-3, and *Amer. Entomologist*, Vol. I, p. 188.

Beetles named—*T. W. Hoyt, Jr.*—Your golden beetles are *Cassida aurichalcea*, Fabr. (See Vol. I, Fig. 177.) The beetle with blue-black wing-covers and rufous head, thorax, legs and antennæ, which "made a sort of crackling noise and emitted smoke which smelt like sulphur from the hind part of his body," is one of our common Bombardier beetles, *Brachinus Americanus*, Lec. Upon one occasion, when we were collecting insects and—as often happens—saw at the same moment two rapidly running beetles, both of which we were desirous to capture, we thoughtlessly put one of the two, which happened to be a Bombardier, between our lips, so as to hold him securely while we caught and disposed of the other one. Forthwith he fired away the customary discharge of blue smoke from his tail; and the next instant our lips felt as if a bottle of the strongest Aquafortis had been emptied upon them. But we were not to be fooled thus. The more he blazed away the tighter we held him; and after a copious discharge of saliva from our mouth, the disagreeable sensation passed off in some five minutes, without any further unpleasant results.

Royal Horned-Caterpillar—*W. C. Holmes, Plattsburg, Mo.*—The immense horned worm you send, is the species which was illustrated in the colored plate to our first volume.

M. G. Kern, Supt. Lafayette Park, St. Louis, Mo.—The worm you found on Lilac is the same Royal Horned-Caterpillar. The fact of its occurring on Lilac is, we believe, entirely new to science.

Parsnip Caterpillar—*T. W. Hoyt, Jr., St. Louis, Mo.*—The worms found on Parsnip, which are green, marked with transverse black stripes and yellow dots, and which protrude from the first segment, when disturbed, two orange-colored strong-smelling processes, are the larvæ of our most common black swallow-tail butterfly, *Papilio asterias*, Cram.

Bad packing—*Dr. W. W. Butterfield, Indianapolis, Ind.*—Owing to your bad packing, the glass vial, containing the "aquatic insects," broke in Uncle Sam's mail-bags, and not a solitary bug of the whole lot reached us. We only hope that none of them crawled into some young lady's love-letters, while they were rampaging round among the postal matter.

Insects named—*C. P. Faulkner, Bridgeport, Conn.*—No. 1 is not *Necrophorus americanus*, Oliv., which is a much larger and handsomer insect with the elevated middle part of the thorax looking like red sealing-wax, but *N. marginatus*, Fabr. Both have similar burying habits. No. 2 is *Creophilus villosus*, Grav.—usually found under small pieces of carrion, where it preys upon carrion-eating insects. We have noticed the allied *Listotrophus cingulatus*, Grav., which haunts cowdungs, fly off from its favorite abode with a large *Hister* in its mouth. No. 3 is *Coccinella bipunctata*, Linn. No. 4 is not *Melanotus communis*, Schönh, but *M. incertus*, Lec. The two are very closely allied, but *incertus* is on the average a considerably larger species. No. 5 is *Scarites subterraneus*, Fabr. We have dug up many of this species from the burrows of the large southern Dung-beetle, *Copris carolina*, Linn., and believe that it lays its eggs there and in other such situations, and that its larva lives upon dung-feeding larvæ. No. 6 is *Uloma impressa*, Melsh., very abundant in all its stages under decaying bark in the woods. This species was formerly confounded with *U. culinaris* of Europe, which, as the name denotes, haunts kitchens. No. 7 is *Ips fasciatus*, Oliv.—The *Elater* family is a very difficult one, very numerously represented in the U. S.; and it is impossible to identify your species from your description, which neither specifies the size nor includes a single generic character.

Beetle named—*Wade Keyes, Florence, Ala.*—Your Beetle is *Calopteron* [*Lycus*] *terminale*, Say, and is tolerably common, occurring on a variety of different plants. The larva, which is clay-yellow prettily spotted with black, and very closely resembles the wingless female of the European genus *Drilus* as figured by Westwood (Introd. I, p. 247, fig. 13), occurs under prostrate logs, where it no doubt feeds upon the numerous larvæ that are found in such situations We have bred this beetle through all its stages, and upon one occasion, having determined to preserve a pupa of this species as a cabinet specimen, we pinned it through the thorax with a very fine No. 8 pin. Directly after we had done this, we changed our mind, removed the pin, and replaced the pupa in the breeding-jar. A week or two afterwards this very same pupa developed into a perfect specimen of the beetle; thus showing how tenacious of life some insects are. If a lamb was run through the breast with a sword, and then left to shift for itself, it would not be very apt to develop into a perfect full-grown sheep. LeConte in his Catalogue, but not in his edition of Say's *Entomology*, considers *terminale* Say as a mere variety of *reticulatum* Fabr., which has across the middle of its wing-cases an additional black band, but is otherwise undistinguishable. We have captured hundreds of both forms, and as we have never met with any intermediate grade, we incline with Say to think *terminale* a true species. It would be interesting to know whether or not *reticulatum* differs in its larval and pupal stages from *terminale*.

Moth named—*W. G. Barton, Salem Mass.*—The moth which you describe as having the front wings pink edged at tip with yellow, is probably *Alaria florida*, Guen. This insect expands about one and a quarter inches, and you will find an account of its larva by Mr. W. Saunders in the *Canadian Entomologist*, Vol. II, page 6, or in Dr. Fitch's twelfth Report. It feeds on the Evening Primrose (*Œnothera.*)

Worm boring into Cucumber—*G. W. C., Alton, Ill.*—The pale worm which enters and bores into your cucumbers, and which is nearly of the same color as the inside of that vegetable, produces a very strikingly marked moth of a yellowish-brown color, with an iris-colored reflection, the front wings having an irregular semi-transparent dull yellow spot, not reaching their front edge, and constricted at their lower edge, and the hind wings having their inner two-thirds of this same semi-transparent yellow. The moth is new to us, and during a recent trip East we found no Entomologist who could identify it. It belongs to the genus *Phakellura*, and is evidently Cramer's *nitidalis*, though the larva is said by Guenée to feed on potatoes. We have found this worm quite common in southerly latitudes the present year, boring into melons, both musk and water. A very similar worm, which however we have not yet bred to the moth state, has been this autumn exceedingly destructive to the cucumbers near Rock Island, in Northern Illinois. In company with this, but in smaller numbers, we have also met with a rather smaller worm, of a pale light yellow color and dotted with black very much like the larva of the Currant Worm Moth. (See Figure 8, *aa* in this Number). We have not yet reared this last to the moth state, but hope to do so before long. Of course, in a northerly latitude, insects do not develop as early in the year as they do further South.

O. L. Barler, Alton, Ill.—The worms which have ruined so many of your Nutmeg Melons by boring into them, and causing them to rot, are the same species spoken of above.

E. S. Smith, Pevely, Mo.—The worm boring into your Crook-neck and Hubbard squashes is the same species.

Caterpillar of the Io Moth—*Mrs. Tildesley, West Baden Springs, Orange Co., Ind.*—The grass-green worm found on Locust, with a conspicuous white and lilac-colored line along each side, and covered with numerous tufts of yellowish-green prickles, is the larva of the Io Moth (*Saturnia Io*, Sm. and Abb.) The moth receives its name from two conspicuous eye-spots on the hind wings, in allusion to the ancient Greek heroine Io, who, as the fable went, was jealously guarded by the hundred-eyed Argus. The sexes differ very greatly from each other, the general color of the ♂ being deep yellow, while that of the ♀ is purple-brown; though the same pattern is observable in both. The caterpillar is capable of stinging with its spines.

Worms on Cherry and on White Beech—*D. B. Waite, Springwater, N. Y.*—The worm that is "playing foul with your cherry trees" had spun himself up before he reached us; but from a peep that we got at him through a rent in the cocoon, he appears to be different from anything known to us. The other larva that usually feeds on beech, but will also eat grape leaves, was also spun up; and as we have no beech near us and are almost entirely unacquainted with the insects that infest that tree, we thought it useless to disturb him; more especially as, if the cocoon was cut open, the larva would most probably die, and by nursing the cocoon carefully through the winter we hope to breed the moth from it next summer. If we succeed next year in rearing the moths from either or both of your two cocoons, we will take care to advise you immediately what they are.

Apple-tree worms—*H. K. Vickroy, Champaign, Ill.*—The small green 16-legged larvæ, nearly half an inch long and with a broad dark brown stripe on each side extending the whole length of their backs, which you find doing considerable damage to the Apple-tree, belong to a new and hitherto undescribed species. These larvæ were first communicated to us by A. C. Hammond of Warsaw, Ill., early in Sept. 1868; and subsequently at the Illinois State Fair specimens were shown to us by W. T. Nelson, of Wilmington, Ill. At the latter end of May, 1869, we bred the moth from them; and a full account of the species, illustrated by figures, will be published in the Second Annual Report of the Senior Editor. The mode in which this larva operates on the apple-tree is by tying together the leaves with silken cords, forming a mass of considerable size inside which it lives gregariously, skeletonizing the leaves that it has thus appropriated and filling them with its gunpowder-like excrement. It was so abundant in 1868 near Warsaw and Quincy as nearly to strip many trees, especially in young orchards that were in an unthrifty condition. It is quite different from the Rascal Leaf-Crumpler (*Phycita nebulo*, Walsh), which lives all the time in a little black horn-like case, whereas this larva carries no house on its back. And moreover the Leaf-Crumpler is solitary in its habits, whereas this species lives in communities of several dozen during its entire larval life. As to the moths produced from these two larvæ, they are as different from each other as a goat is from a sheep. To distinguish our species from the Rascal Leaf-crumpler, we may call it in English "Hammond's Leaf-tyer" (*Acrobasis Hammondi*, n. sp.)

Stinging larvæ—*J. C. Falls, New Albany, Ind.*—The lepidopterous larvæ which you send are those of the Saddleback-moth (*Empretia stimulea*, Clemens), a species which has derived its English name from the saddle-like dark spot on the middle of its back. The two scientific names are derived respectively from a Greek word which means "to burn," and a Latin word which signifies "a goad." We shall shortly publish an article on "Stinging Larvæ," giving figures and descriptions of the very few that possess this peculiar power, so that our readers—and especially our fair readers, whose hands may be presumed to be more delicate and susceptible than those of us rough bearish men-fellows—may take due warning and govern themselves accordingly. Our own experience is that these larvæ produce no effect whatever on the palm of the hand, but if any of their sprangling prickles touch the back of the hand, or any other part of the body where the skin is not hardened and horny, then the result is about the same as if the same part had been stung by nettles.

Lappet Caterpillar on Apple-tree—*William Stark, Louisiana, Mo.*—We regret to say that the first caterpillar you sent was so rotten and stank so badly, that we were glad to fling it away the moment the box containing it was opened. The second "ugly wooly worm" found high up on a Rome Beauty Apple-tree, and which was broad and perfectly flat below, with fleshy, lappet-like appendages at its sides, was the larva of the American Lappet Moth (*Gastropacha Americana*, Sm. & Abb.) which you may find figured on page 377 of Harris's Injurious Insects. The species is rather rare, and there is but little risk of its undue multiplication.

Spined Spider—*G. W. Kinney, Snow Hill, Mo.*—The odd-looking angular spider, of a shiny mahogany brown, with the upper part of the abdomen yellow, and with two immense spines or thorns projecting from behind, and other smaller ones from above, is *Epeira spinea*, Hentz. It was subsequently described as found sparingly near Murphysboro, in South Illinois, by *Vespa* (Cyrus Thomas?) in the *Prairie Farmer* for 1861 (Vol. 23, page 169), under the name of *Epeira* (*Gasteracantha*) *spinicauda*. Near Rock Island, in North Illinois, it is by no means uncommon.

T. W. Gordon, Georgetown, Ohio.—The spider sent by you is the same species spoken of above in answer to Mr. Kinney.

Dangerous looking—*Dr. M. M. Kenzie, Centreville, Mo.*—The "dangerous looking" hairy ant-like insect of a black color with the forehead, upper part of thorax and two broad bands on the abdomen of a deep rufous, is ♀ *Mutilla coccinea*, Linn. The ♂ is somewhat smaller and has wings. This insect belongs to the Digger Wasps, and the sting of ♀ is said to be exceedingly severe.

Bag-worms again—*T. C. Tipton, Williamsport, Ohio.*—The worms which are literally eating up your Cedar trees are the common Bag-worm, which we have already frequently referred to under this head. We shall publish an article on this insect in our next number. *The Tomato-worm cannot sting!* The common House-fly breeds in stable manure. We shall give its natural history whenever we can spare the space.

Large water beetle—*S. E. Munford, Princeton, Ind.*—In our answer to you last month, we should have mentioned that the water-beetle you sent was ♀, and that in the ♂ the wing-covers, instead of having longitudinal impressed lines, are perfectly smooth, with the exception of the normal rows of fine punctures. Thos. Say, who was the first to describe this species, was not acquainted with the ♂.

Beetles under dead Fish—*T. Ferrell, Frankfort, Ohio.*—The large beetles with round, deep brown wing-cases and yellow thorax with a central dark spot, which you found under a dead fish, are *Silpha* (*Necrophila*) *peltata*, Catesby. They feed on all kinds of carrion.

ERRATA IN VOL. 1, NO. 12.—Page III, column 2, line 36, for "*Brachyrynchus*" read "*Brachyrhyncus.*" Page VII, column 2, line 1, for "Stinging" read "Stinking." Page 235, column 1, line 3 from bottom, for "169, [2]" read "174, [2]." Page 242, column 1, line 18, for "*Musea*" read "*Musca.*" Page 250, column 1, line 12 from bottom, for "*Therydopteryx*" read "*Thyridopteryx.*" Same page, column 2, line 7 from bottom, for "Cartwell" read "Hartwell." Page 251, column 1, line 18, for "Welsh" read "Melsh."

☞ Several answers that should have appeared in the present number, must unavoidably lie over till our next issue.

☞ Our acknowledgements and notices of new works have also been crowded out of this number.

THE

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BENJ. D. WALSH.......................Rock Island, Ill.
CHAS. V. RILEY, 221 N. Main Street.......St Louis, Mo.

UNIVERSAL REMEDIES.

We have received several circulars from the "Union Fertilizer Company of New York," crying up the merits of a miraculous panacea of theirs, which they kindly offer to the public at the low price of $45 per ton, packed in barrels ready for shipment. The Secretary of this Company rejoices in the very appropriate and suggestive name of A. S. QUACKENBOSH, and he assures us that the article which he offers for sale, besides being an excellent Fertilizer, is "sure death and extermination to the Canker-worm, the Curculio, the Apple Moth, the Potato Bug, the Cotton Worm, the Tobacco Worm, the Hop Louse, the Army Worm, the Currant Bug, and all descriptions of insect and vermicular life which infest and devastate the Orchard, the Garden, or the Farm." Of course, as with all other QUACK remedies blazened forth with such a vast parade of BOSH, there is a host of certificates appended to the printed Circular, showing how "the Insect and Worm Exterminator" was applied by Mr. Jones to his currant bushes, and how not long afterwards Mr. Jones's currant bushes were entirely free from worms, though they had previously been swarming with "vermicular life;" how Mr. Smith, who had manured his potato patch with the Patent Exterminator, raised a much better crop of potatoes than his neighbor Thompson, who had tried to grow potatoes without any manure at all; and how a dozen different men, whose orchards were formerly much troubled with canker-worms, and who have, for the last year or two, been drenching their apple trees with heroic doses of this never-failing Bug-destroyer, have scarcely seen a single canker-worm on their trees, ever since they invested their money in the Great Miraculous Insect-killing Exterminator. But who does not know that, whether the "Exterminator," be applied or not, all currant-worms after they have got their growth disappear from among the leaves in order to form their cocoons? Who denies that every Fertilizer, that contains no other ingredients than clean sand, must necessarily be more or less beneficial to some crop or other; and that though it may be positively injurious to wheat, to corn, to hops and to fruit trees, it may yet be an advantageous preparation to apply to potatoes? Lastly, what well informed Orchardist is not aware that, for the last year or two, the Canker-worm in several widely-remote regions in the United States has ceased to swarm as it used to do—most probably from the action of the different parasites that prey upon it, either when it is in the egg or when it is in the larva state? The trouble with all such panaceas as this vaunted New York "Exterminator" is, that we hear nothing of the ninety and nine cases where the Universal Remedy was applied and found to do no good, while in the one case where the medicine worked well, or was supposed to work well, the happy experimenter lauds it to the skies in a flaming advertisement. In the words of the veteran sportsman, when his juvenile companions were bragging of their achievements with the fowling-piece—

> What is hit is history,
> But what is missed is mystery.

Of course, for all such interesting and instructive advertisements as those above referred to, the eloquent inditer of them may, or may not, get "value received" from this Right Honorable Company, which has apparently been born under the most felicitous auspices in Wall street, N. Y., and after being carefully nursed through a rickety childhood in the Gold Room of the Great City of Gotham, is now in its mature manhood flooding the whole country with its elegantly printed Circulars, in praise of "the only sure Remedy for destroying Worms and Insects injurious to Vegetation."

"But," it will be said, "these are mere vague generalities." Well, then, let us come to close quarters with A. S. QUACKENBOSH, Esq. You assert roundly, friend QUACKENBOSH, that your Patent Nostrum is "sure death and extermination" to all descriptions of insect life. Of course, then, you have experimented with the different noxious insects that afflict the Farmer, the Fruit-grower and the Gardener, and are tolerably familiar with the natural history of each of them. Of course you are well acquainted with the twelve very distinct bugs that attack the Potato, as long ago catalogued in this Magazine, and the two different worms that infest the Cotton Plant, namely, the Cotton Caterpillar and the Boll Worm. Of course you are thoroughly aware that the Tobacco Worm, which troubles the Connecticut Tobacco-farmer, is a very distinct species from that other Tobacco Worm, which is found in Kentucky and Maryland and Virginia. Of course you are completely posted as to the well-ascertained fact, that the Cotton Caterpillar of the South, the true Army Worm of the Northern States, and in the North West corner of New York the Tent Caterpillar of the Forest, are all three of them, in certain localities, popularly designated by the same name of "Army Worm." Of course you yourself perfectly understand what you mean by the term "Currant Bug;" but, for our own part, we must candidly confess that we never heard any particular insect called by this name, though we have in our time listened to a great deal of talk about "Currant Borers," and "Currant Worms," and "Currant Plant-lice." Since, then, Mr. Secretary QUACKENBOSH, you know so much on all these different entomological points—which after all are the mere A, B, C of the science—how in heaven's name does it come about that, on the very Title-page of your Great Braggadocio Circular, you warrant your Patent "Fertilizer" to be sure death and extermination to "THE Potato Bug, THE Cotton Worm, THE Tobacco Worm, THE Army Worm, and THE Currant Bug?" Are you actually green enough to suppose, that there is only ONE kind of Potato Bug, when in reality there are TWELVE? That there is only ONE Worm that infests the cotton plant, when in point of fact there are TWO? That there is but ONE Tobacco Worm, and ONE so-called Army Worm, when every entomologist knows that there are TWO insects which pass by the former, and THREE which pass by the latter name? And lastly do you expect us poor ignorant country folks to understand, at the very first glance, what you mean by your recondite and learned disquisition about "THE Currant Bug?" QUACKENBOSH! we are really sorry for you! We fear greatly that, instead of being a decently good entomologist, tolerably well acquainted with the Noxious Insects of the United States, you are a mere entomological QUACK; and that, instead of talking good common horse-sense to us, you are uttering all the time nothing but BOSH!

In sober serious earnest, what Stock-grower would trust a sick horse or a sick cow to a veterinary surgeon, who actually did not know the difference between a horse and a cow? And yet thousands of farmers are trusting every day to the delusive humbug, which is broached by this New York Company, about the hundreds of different kinds of Noxious Insects that swarm among us in the country, when it is demonstrable from the very circulars, which this precious Company puts forth with such brazen effrontery, that it cannot tell the difference between a Bee and a Beetle; and that the only insects with which it is practically familiar are the insects of city life, namely, Cockroaches, House-flies, Mosquitoes, Fleas and Bedbugs, with perhaps a small infusion of Head-lice and Body-lice. Farmers of the United States! how many more times are you going to be fooled by a set of men, who live in a wilderness of brick walls and brown-stone palaces; and know no more about you and your thousand and one insect enemies, than a Scotch Highlander does about knee-breeches?

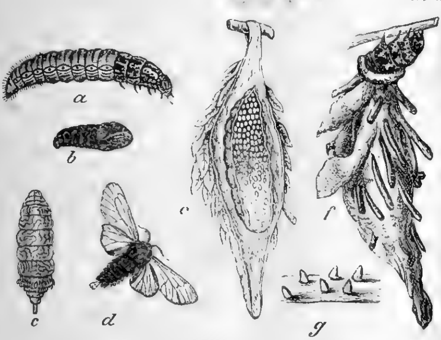
In one word, we would earnestly advise our readers, whenever they meet with a preparation which is warranted to destroy all bugs without exception—no matter whether it be labeled as "Best's Invigorator" or as the "Insect Exterminator" of some Eastern Company—to set down the authors of that preparation as quacks, charlatans and humbugs. Different insects differ far more widely from each other, than does a Horse from a Hog or a Sheep from a Rabbit; and as we know that food that would poison a horse may often be eaten with impunity by a hog, and that a sheep can thrive upon a great variety of weeds which would be deadly poison to almost any other plant-feeding quadruped, we may reasonably infer *a priori*—even if we have no special experience on the subject—that a particular chemical preparation may sometimes be destructive to one particular form of insect life, and yet prove to be entirely innocuous or even salutary when employed against every other species of insects. Nothing is more certain than that there is no Royal Road to the destruction of the Bad Bugs; and that the only way in which we can fight them satisfactorily, is by carefully studying out the habits of each species, and adapting the mode of attack to the peculiarities of the fortification, which we are about to besiege. The tactics that took Sevastopol would have failed at Vicksburg; and Richmond would never have fallen, if the operations which proved so successful against the Mississippi fortress had been exclusively employed against the capital city of the Southern Confederation.

THE BAG-WORM, alias BASKET-WORM, alias DROP-WORM.

mostly my figures, the credit
some of them somewhat altered).

(*Thyridopteryx ephemeræformis*, Haw.)

[Fig. 28.]



Colors—(*a*) livid brown, black and white; (*b*) dark brown; (*c*) whitish; (*d*) black.

Mrs. Mary Treat, of Vineland, N. J., sent us last June great numbers of the newly-hatched larvæ of this Bag-worm, and expressed a desire to learn something of their natural history. As we are continually receiving specimens of this peculiar insect, for determination, we have concluded to give an account of it, by aid of the above illustrations. (Fig. 28.)

The Bag-worm may be regarded as a Southern rather than a Northern insect, though it is found as far North as the northern part of New Jersey. It may even occur at points above this; but specimens which Dr. Harris hatched on his place, at Cambridge, Mass., from eggs obtained from Philadelphia, had not yet acquired their full growth by the 25th of September; and he expressed the opinion, that the greater portion of them would be arrested by frost before completing their growth.* Mr. C. J. S. Bethune also informs us that it is not met with in Canada.

It is known to occur on Long Island, N. Y., in New Jersey, Massachusetts, New York, Pennsylvania, Ohio, Maryland, District of Columbia, the Carolinas, Georgia, Alabama, Kentucky, South Illinois, and South Missouri. Like the Canker-worm, the Tussock-moth, and all other insects in which the perfect female is wingless, the Bag-worm is extremely local in character, often abounding in a particular neighborhood, and being totally unknown a few miles away.

The clothing made by different solitary insects, for protection either against the inclemencies of the weather or against their enemies, is even more varied in cut and make-up, than are the divers costumes of the different peoples, civilized and barbarous, which inhabit our globe. Some insects live in the interior of leaves, using the upper and under cuticles as protection; some make their coats out of the leaves themselves; some make cases of a sort of gummy cement, while others use cases of spun silk; but by far the greater number, of those which protect themselves at all, employ silken cases which they cover and disguise with some other material. Thus, lichens, grass, rushes, stones, shells, sand, wool, cotton, hair, wax, and the bark, twigs and leaves of trees, are all used for this purpose, while a few worms actually use their own excrement arranged on the outside of their cases with mathematical precision. Unlike us mortals, however, these insects do not change the fashion of their dress with every change of season, but follow strictly the pattern used by their ancestors, who cut, spun and wove, ages before our primordial mother sewed fig-leaves together to hide het nakedness. The follicle of our Bag-worm is covered by the leaves and stems of those trees or shrubs upon which it subsists; and when evergreen leaves are used they are often very regularly and prettily arranged after the fashion of thatching.

Throughout the winter, the weather-beaten bags of this insect may be seen hanging from almost every kind of tree. Upon plucking them at that season many will be found empty, but the greater proportion of them will, on being cut open, present the appearance given at Figure 28, *e*; being in fact partly full of soft yellow eggs. Those which do not contain eggs are the male bags, and his empty chrysalis skin is generally found protruding from the lower end. From the middle to the end of May, in the latitude of St. Louis, these eggs hatch into little active brown worms, which, from the first moment of their lives, commence to form for themselves coverings. They crawl on to a tender leaf, and,

* Entomological Correspondence, Harris, p. 244.

attached by the anterior legs, with their tails hoisted in the air, they each spin around themselves a ring of silk, to which they soon fasten bits of leaf. They continue adding to the lower edge of the ring, pushing it up as it increases in depth, till it reaches the tail, and forms a sort of cone, as represented in Figure 28, *g*. As the worms grow, they continue to increase their bags from the bottom, until the latter become so large and heavy that the worms allow them to hang, instead of holding them upright, as they did while they were young. By the end of July, the worms acquire their full growth, when they present the appearance of Figure 28, *f*. At this stage, on being pulled out of its bag or follicle, the worm appears as at Figure 28, *a*, that portion of the body which is always covered by the bag, being soft, and of a dull, smoky brown, inclining to reddish at the sides; while the three anterior, or thoracic segments, which are exposed when the insect is feeding or marching, are horny, and mottled with black and white. The prolegs, on the hidden part of the body are but poorly developed, and consist of but slight wart-like projections; they are furnished, however, with numerous small hooks, which answer an admirable purpose, in enabling the bearer to cling to his home-spun coat, which shelters him from the weather, and defends him from his enemies, and which is even more essential to his existence than are the clothes we wear to ours. The worms do not arrive at their full-grown condition without passing through critical periods. At four different times during their growth they close up the mouths of their bags, and retire for two days to cast their skins or moult, as is the nature of their kind, and they push their old skins through a passage which is always left open at the extremity of the bag, and which also allows the passing of the excrement.

During their growth they are very slow travelers, and seldom leave the tree on which they were born; but when full grown they become quite restless; and it is at this time that they wander by the day, dropping on to persons by their silken threads, and crossing the sidewalks of our cities in all directions. It is from this habit of dropping on to persons that they have been called "Drop-worms." A wise instinct urges them to thus wander from place to place, for, did they remain on one tree, they would soon multiply beyond the power of that tree to sustain them, and would in consequence become extinct. When they have lost their migratory desires, they fasten their bags very securely by a strong band of silk to the twigs of the tree on which they happen to be. Here again, a strange instinct leads them to thus fasten their cocoons to the *twigs* only of the tree they inhabit, so that these cocoons will remain through the winter; and not to the leaf-stalk, where they would be blown down with the leaf. After thus fastening their bags, they line them with a good thickness of soft white silk, and after turning around in the bag so as to have the head towards the lower orifice, they rest awhile from their labors, and at last cast their skins and become chrysalids. Hitherto the worms had all been alike in appearance, but now the sexes are distinguishable, the male chrysalis (Fig 28, *b*) being but half the size of that of the female, and exhibiting the encased wings, legs and antennæ as in all ordinary chrysalids, while hers shows no signs of any such members. (See inside of bag at *e*). Three weeks afterwards a still greater change takes place the sexes differentiating still more. The male chrysalis works himself down to the end of his bag, and, hanging half-way out, the skin bursts, and the moth (Fig. 28, *d*,) with a black body and glassy wings, escapes, and, when his wings are dry, soars through the air to seek his mate, who is not blessed with wings, but is an abortive affair with the head and general appearance of the larva, but still more degraded, since she has not even the legs which it possessed: she is in fact a naked yellowish bag of eggs, with a ring of soft light brown silky hair near the tail. (See Fig. 28, *c*).

Dr. Harris wrote to Edward Doubleday, on the 29th of October, 1849,* as follows:

"The males are disclosed in September and the early part of October, and immediately afterwards the females will be found to be impregnated. I examined about fifty female follicles on the 25th of October, and found all the females escaped, and their puparia half full of fertilized eggs. It is not true that the females remain in their puparia or in their follicles. Among all those examined as above mentioned, not a single female was discovered; they had come out of their pupa skins, and had also left their follicles. It is only at an early period, or in some rare cases when the females have remained unimpregnated till this time, that any females are to be found within their pupa skins. But they do not leave their pupa skins until they have been impregnated, and have laid their eggs.

"How the male contrives to get at the female is a mystery that I have not yet solved. The pupa skin of the female splits in the middle of the little carinated ridge found on the top and fore part of the thorax, and also laterally, so as to admit of a kind of **T**-shaped opening. It is through this that the male organ must be intro-

*Entomological Correspondence, p. 179.

duced, and, passing between the back skin of the pupa and the body of the female, reach her hinder extremity in the bottom of the pupa skin. But, in addition to this extent to be penetrated, the male has to penetrate the whole length of the lower orifice of the follicle, say half an inch, before he can reach the head of the puparium. The female lays her eggs in the puparium or pupa shell, receding from it as she does so, and filling the shell half or two-thirds full of eggs. The rest of the shell she fills with a fawn-colored down, rubbed off her own body."

In order to elucidate and forever settle these two points in the natural history of our Bag-worm, we have closely studied the habits of this insect, and have not only examined hundreds of specimens in the open air, but have reared great numbers within doors from the egg to the perfect state, watching their operations day by day. The females of several insects which inhabit similar follicles (genera *Œceticus Psyche*, etc.), are perfectly wingless. They are, indeed, the most degraded and imperfect of moths, and afford a marked exception to that very general, but not universal rule as laid down by Agassiz, viz: that the earliest condition of an animal cannot be its highest. It is well known that certain European species never quit their follicles, and that the shrunken body not only lies near the orifice and protects her eggs, but that it forms the first food of the young larvæ, who play the carnivorous role for the first moments of their lives, by subsisting on this remnant of their mother's body. It is consequently stated by most European authors, as a characteristic of the group, that the females never quit their cases. But as Harris well remarked in the above extract, the insect of which we now write, forms an exception to this rule.

The manner in which fertilization takes place is easily explained, though we are not one bit surprised that to Dr. Harris, and to all who have not given close attention to the matter, the *modus operandi* should be involved in such mystery.

The males of most insects mature before the females, but if we take a given number of our Bag-worm cocoons, one-half of which are males and the other half females, and cut them open at the time that the first male makes his appearance from the lot, we shall find that many of the females have already burst open the pupa shell at its anterior or lower end, and have worked themselves through the aforementioned **T**-shaped opening, to the lower end of the follicle. The puparium is held tenaciously to the upper part of the follicle by the abundance of soft but tough silk with which the follicle is lined, but it is extenuated to nearly double its natural length by the efforts which the female makes in emerging. The female never withdraws herself entirely from the pupa shell, but holds on to it by her terminal segments, being evidently assisted by the ring of wooly hair already referred to. Thus, with the pupa shell extended to its utmost capacity, and the additional length of her whole body, she is enabled to reach to the lower orifice of the follicle, where she patiently awaits the male, and after meeting him, works herself back into the pupa shell. Here she deposits her eggs in the upper part, intermingling them, and crowding the lower part of the puparium with the peculiar fawn-colored down already referred to. After having thus cosily secured her eggs against the winter's blasts she works herself out and drops exhausted to the ground.

The eggs are very soft opaque ob-ovate bodies about 0.05 inch long, and each is surrounded by more or less of the down, which cannot well be detached from it, and seems to be part and parcel of the external surface. The fulvous or fawn-colored down is in reality extruded from the abdomen, and not rubbed off the body as stated by Harris. This fact becomes apparent when we consider the nakedness of the body, and may be proved by dissecting an impregnated female just before the laying of the eggs, or by a microscopic examination of the down itself. It is in reality a very fine silk and not hair. Not only are the eggs mixed with it, and the lower third of the puparium tightly crowded with it, but there is always an abundance of it mixed in with the white silk at the lower end of the follicle, and evidently scattered by the emaciated female in her exit.

Follicles in which the female is waiting for the male may be distinguished even without cutting into them, for her body entirely fills up their lower third which is otherwise contracted and empty. In a state of nature the females scarcely ever fail to get impregnated, but in confinement a majority of them thus fail, and in such an event they remain at the lower part of the follicle until death. Out of 82 ♀ follicles that were set apart by us last September, in a separate cage, so that no males could reach them, every one of them died in this manner, and we could not find a single attempt at virginal reproduction, though very closely allied species have been known to produce impregnated eggs without fecundation.

The males emerge during the warm morning hours. They are very active, and in confinement generally batter themselves to death within two days. The penis is telescopically extensile to about twice the length of his body, and he is thus enabled to reach the female without difficulty.

This insect is essentially polyphagous, for it occurs alike on evergreen and deciduous trees. We have found it on the red and white elms, the common black and honey locusts, Lombardy poplar, catalpa, Norway spruce, arbor-vitæ, osage orange, soft and silver maples, sycamore, apple, plum, cherry, quince, pear, linden, and, above all, on the red cedar, while Mr. Glover has also found it on the cotton plant in Georgia. We have even seen the bags attached to raspberry canes; but the Ailanthus, which is now extensively grown in our large cities for shade and ornamental purposes, will be found entirely exempt from its attacks. There seems to be a very general prejudice against this tree on account of the rather unpleasant and fetid odor of the male blossoms, and we were much surprised at the wholesale tirade against it, that was made by the editor of the *Horticulturist* in 1869 in the August number of that journal. In view of the fact that it is so free from the attacks of injurious insects, we deem it well worthy of cultivation; and those who do not like the odor of the male blossoms, ought to know enough, either to cut them off at the proper time, or to grow only the female tree which produces no unpleasant effluvium, and which, with its large cluster of seed-pods—now yellow, now assuming almost every tint from flesh-color to crimson—forms, in our eyes, a most graceful and pleasing sight. In 1868 we had noticed that this tree when surrounded by other kinds, would have a few isolated bags hanging from its twigs, and it became a question in our minds whether the Bag-worm actually disliked the leaves, or whether the leaves being compound, its usual instinct failed it, insomuch that it fastened its case to the mid-stalk, which falls to the ground. But after ample experiment the past summer, with worms newly hatched and with others of various ages, we have concluded that they cannot live on Ailanthus leaves, and that such few bags as are found upon this tree in winter, have been fastened there by worms which had traveled from other kinds of trees.

This insect is also exceedingly hardy and vigorous, and the young worms will at first make their bags of almost any substance upon which they happen to rest when newly hatched. Thus, they will construct them of leather, paper, straw, cork, wood, or of any other material which is sufficiently soft to allow of their gnawing it, and it is quite amusing to watch their operations.

Remedies.

How often does the simple knowledge of an insect's habits and transformations, give the clue to its easy destruction! From the foregoing account of the Bag-worm, it becomes obvious, that by plucking and burning the cases in the winter time, the trees can be easily rid of them. If this is done whenever the first few bags are observed, the task of plucking is light; but where it is not so done, the worms will continue to increase, and partly defoliating the tree each year, slowly, but surely, sap its life.

For many years this insect had been multiplying in the city of St. Louis, until in 1868 it had become exceedingly abundant and destructive, especially in the older portions of the city. So many trees were unhealthy, and dwindled or died, that tree planters frequently became discouraged. Very few persons, however, suspected that the Bag-worm was the cause, and still fewer were aware how easily its ravages were checked, until last winter, the Junior Editor called attention to the matter through the columns of one of the daily papers, and urged the destruction of the bags and their contents before the trees again put forth their leaves. This appeal, we are glad to say, was duly responded to by the citizens; for in less than a month, the trees in the public parks and around the court-house, and also along many of the streets, were entirely cleared of the bags. Indeed, we have seldom known entomological information to be fraught with such immediate and beneficial results! It even opened up a new field of employment for certain enterprising youths, who, with a dirty copy of the daily already referred to in hand, might have been seen trotting up some of the principal avenues, and shrieking out, newsboy fashion: "Clean your Bag-worms off, ma'am." "Clean your trees, sir?—take 'em all off for a dollar!"

Though the very first efforts of the newly-hatched worm are directed to building for itself a covering, and though, throughout its larval life, it is always covered and protected by this covering, this insect is yet subject to the attacks of parasites, two of which are already known to assist us in subduing it.*

* *Cryptus inquisitor*, Say, and *Hemiteles thyridopteryx*, Riley.

☞ The publishers of those papers which advertise to club with ours, will please take notice of our change of subscription price.

TENT-CATERPILLARS AND FALL WEB-WORMS.

The following appears in the *Western Rural* of August 26, 1869, from the pen of a correspondent:

The Tent Caterpillar has taken possession of many fine young trees, and spread his web from "pole to pole," for many are stripped of foliage and resemble bare poles.

The true Tent Caterpillar, or as it is often briefly called, "The Caterpillar," hatches out in the spring almost before the leaves of our apple trees put forth. Early in June they spin up, and the moths, which are of a reddish brown color, make their appearance early in July, shortly after which they deposit their eggs in the well-known rings on the twigs, of which we gave a drawing (Fig. 145 *c*) on page 208 of our first volume. The Fall Web Worm, on the contrary, does not hatch out till August, and although it makes a very similar web-like nest to that constructed by the preceding species, it is yet a much smaller insect and somewhat differently colored. Towards the end of the summer this worm spins up like the true Tent Caterpillar; but instead of the Moth bursting forth from the cocoon the same season, it does not make its appearance till the middle of the following season. Moreover this moth, instead of being reddish brown, is of a pure milk-white color, and it does not lay its eggs in a ring upon the twigs, but deposits them in an irregular mass upon a leaf. Thus it will be seen that one insect hybernates in the egg state, the other in the pupa state: one larva appears in May, the other in August; one moth is brown, the other is white; and one lays its eggs on the twigs, because if it laid them on a leaf they would fall off the tree and be lost in the winter, whereas the other species lays its eggs on a leaf, because it is instinctively aware that those eggs will hatch out long before the leaf falls to the ground.

No two insects are more frequently confounded than the true Tent Caterpillar (*Clisiocampa americana*, Harris), and the Fall Web Worm (*Hyphantria textor*, Harris); so that the correspondent of the *Western Rural* will find plenty of company in the mistake that he has made, in speaking of Tent Caterpillars in August. Both species are very general feeders, the nests of the Tent Caterpillar being found on the Wild Black Cherry, the Apple, the Crab, the Choke Cherry, the cultivated Cherry, the Plum both wild and tame, the Thorn, and the Shad bush, but scarcely ever on the Pear or on the Peach; while those of the Fall Web Worm occur in the greatest abundance on Hickories, especially the Pignut Hickory, and also on Wild Black Cherry, Apple, Crab, Ash, Elm, Willow, Oak, Birch, and Sycamore or Buttonwood.

EXPERIMENTS WITH THE JAPANESE SILK-WORM.

(*Antherea Yama-mai.*)

BY W. V. ANDREWS OF NEW YORK.

In the year 1868 I made some experiments in rearing the Ailanthus Silk-worm (*Samia Cynthia*), an account of which appeared in the *American Naturalist*, in the August number of that year. I was of opinion then, and am now, that Cynthia is the moth best adapted to our northern climate as a silk-producer. My reasons need not be repeated here, but I may say that, since writing the article above adverted to, I have received from Dr. Wallace, of England, a specimen of sewing silk made from the cocoon of the Cynthia, and its appearance and quality have strengthened my previous favorable opinion.

By way, however, of ascertaining the species of silk-worm moth most suitable to the climate of North America, I obtained from Dr. Wallace a number of the eggs of the Japanese silk-worm known as Yama-mai, which is said to produce a most beautiful silk, of a greenish color, and the cocoons of which are as easily reeled as are those of the ordinary silk-worm (*Bombyx mori*). These eggs were sold to persons residing in widely distant localities, while I reserved a considerable number for my own use.

I propose in this paper to give the readers of the ENTOMOLOGIST not only an account of my own experiments with this insect, but also a synopsis of the results of the experiments of my correspondents, so far as I have been able to ascertain them.

The whole of the eggs I received from England arrived in New York in the months of March and April. I am inclined to think that this is a bad time to receive them here, and that in future it will be better to receive them in the fall, so that they may be forwarded to their respective destinations before the severe cold sets in, thus enabling parties living in widely distant latitudes to keep their eggs at a temperature which, without injuring the egg, will retard the hatching till such time as vegetation in their respective localities shall be so far advanced as to afford the caterpillars a good supply of food. If the eggs be kept in England till early spring, it is clear that they will be somewhat developed by the warmth of the climate, which development may be seriously checked if the temperature here should be, as it probably would be, much lower than the temperature of England. Disease may be thus induced; and my opinion is that most of the failures occurring here this last season may be attributed to this cause.

It will be perhaps remembered that the spring of 1869, at least on the Atlantic coast, was very backward. The consequence was that, when on April 26th some of the Yama-mai eggs began to hatch out, there was nothing worthy of being called an oak-leaf to be found for them. The few warm days occurring at this time were sufficient to complete the development of the caterpillar, but not sufficient to make the necessary advance in the growth of its food-plant. Buds, rather than leaves, of *Quercus coccinea* were however obtained, and upon these the larvæ fed a little. Still they were very sluggish and inert, and the weather again becoming very cold, most of this first lot died within the first two days. Dr. Wallace recommends that the larvæ be removed, as they hatch out, to strips of glass moistened with water so that they may drink. A better plan is, I think, to remove them at once to branches, the leaves of which have been well sprinkled. Moisture in some way should, I have no doubt, be furnished them.

By May 3d nearly all the caterpillars, amounting to over a hundred, had died from the prevalence of cold. I was obliged to keep them within doors, and they appeared to eat a little during the day; but they became torpid during the night, and in the morning were all but inanimate. The temperature had ranged from 40° on April 26th to 58° on the 27th, and by May 3d had gone down again to 35°.

By May 12th more eggs had arrived from England, and the weather having become somewhat warmer, hatched out almost immediately. These I fed on *Q. coccinea* and *Q. tinctoria* indifferently, the larvæ evincing, I think, a little preference for the former, but doing well on both. The branches were placed in water, under a verandah facing the northeast, so that the rays of the morning sun had access to them, the larvæ appearing to enjoy the warmth. I kept them out night and day, unless the night threatened to be very cold. In warm dry days I sprinkled the branches two or three times with clear water. A short description of the larvæ may not be out of place here.

On hatching out they are brimstone yellow; the body sparsely covered with strong hairs. After the second moult they become greenish, with black spots. After the third moult the color is a beautiful apple-green, with yellow tubercles on each segment, and a few black hairs emerging from each tubercle. The head and legs are chocolate brown, the pro-legs reddish. On the anal legs there is a dark brown or nearly black patch. The first segment is edged with deep pink. In some lights a silver spangle appears on some of the tubercles. The markings do not greatly differ during the remainder of their growth, but the apple-green color becomes, if possible, still more beautiful.

It is almost impossible to imagine weather more unfavorable for the rearing of any foreign insects, than that which prevailed in New York during the months of April and May. I have already noticed this, but it may be well to quote from the record a little farther. On April 26th the thermometer at 6 A. M. stood, as I said before, at 48°; at 3 P. M. it was 71°. On the 27th it was 58° in the morning and 72° in the afternoon, while on the 30th the mercury scarcely reached 55° in the hottest part of the day. On the 2d of May it reached no higher than 41°, keeping quite cold up to about the 22d, when it ranged from 49° at 6 P. M. to 62° at 3 P. M. On the 31st it reached as high as 79°. Dr. Wallace tells us that the temperature most favorable to the welfare of the larvæ is from 50° to 60° in May and 65° to 75° in June, and thinks that a higher temperature "endangers the safety of the worm." Now, in June we had a series of hot days, in which the mercury reached over 86°. The consequence of all this was, that on June 25th, out of about 200 larvæ which had been a few days before apparently thriving, having reached their last moult, all but six were dead. A few may have wandered, and about three died of diarrhea, but the majority died of a disease acting very rapidly, which showed itself first in brown patches, generally on the second and third segments, but which soon afterwards extended over the whole body. Dr. Wallace informs me that in England, this year, Yama-mai has generally failed; the larvæ dying of a disease displaying symptoms similar to those above named. In some cases the larva eats a little after the disease becomes manifest, then suddenly stops, and a few hours afterwards it is seen hanging down from its anal legs a flaccid mass of corruption. A pale green fluid has by this time escaped, generally from between the first and second segments; and all that remains of the once beautiful caterpillar is an empty skin.

Most of my correspondents have also been unfortunate. In some cases the eggs hatched out all right, but the larvæ were so weak that they were unable to feed. On the other hand, individuals who had obtained eggs out of the same lot found no difficulty in getting their larvæ to eat, and for a time to thrive well. So it should seem that, as I hinted before, the temperature at which the eggs are kept may have a good deal to do with the health of the future caterpillar.

Most of us who have been in the habit of raising caterpillars have doubtless met with similar instances where they have refused to eat. Even this year I have seen such in the case of a brood of the Royal Horned-Caterpillar that refused to eat a particle, and of course all died. But even here it is possible that the eggs may have been kept too cool or too hot; and it must be borne in mind that, although I attribute the failure of my Yama-mai to the unfavorable weather, I have by no means forgotten that disease may have been superinduced by the maltreatment of the eggs. Illustrative of this point are two remarkable cases involving one exception to the general failure of the Yama-mai crop to which I have already alluded.

A friend of mine, in Brooklyn, wishing to make sure that his eggs should not hatch out prematurely, placed them in an ice-house where the temperature was about 40°; and the consequence was that not a single caterpillar appeared. Yet a quantity of *B. mori* eggs, placed in the same situation, hatched out, thus showing that Yama-mai eggs cannot be exposed with impunity to a degree of cold that may be harmless to species duly acclimated.

On the other hand, a correspondent in Massachusetts, being also desirous of shielding his eggs from harm, placed them in a glass in his bed-room. The servant, however, objected to this "littering up," and took down the glass to wash it out, throwing the whole of the eggs into very hot water. My friend was just in time to rescue two eggs, both of which hatched out; the caterpillars grew and flourished, and in due time formed beautiful cocoons; and, strange to say, this is the only instance, with an exception to be noticed presently, in which any of my correspondents have this year been successful in rearing Yama-mai. An extract from his letter may be of interest:

"The eggs hatched out May 21st, and on the 14th of July I had one cocoon fully formed, and on the 21st the other. One of the larvæ was much larger than the other, and had five silvery spots on each side, while the other had only two; so I think I have a male and female. The worms were kept in a room facing the south, with doors and windows open, night and day. Highest temperature 98°; lowest 55°, Fahr."*

The other successful instance occurred with the young ladies of the Academy of the Sacred Heart, at Manhattanville, New York, who have had the good sense to introduce the study of entomology, and I believe the other natural sciences, into their admirably conducted school.

One would infer from these facts that, as the time for hatching out approaches, the egg should be exposed, not to direct sunshine, but to a good degree of heat; and this treatment would seem to be the more necessary if, as is generally supposed, the caterpillar is fully formed in the egg shortly after laying, and one can also see why any great or sudden change to a low temperature is injurious to the egg.

A word now as to the food-plant and manner of feeding.

I have little doubt that Yama-mai will feed on any kind of oak, and it is stated in Dr. Wallace's report that they will feed on apple tree. Nay more, that some larvæ which refused "ever green and other fancy oaks," did well on apple. More experiments are required in this direction, for it is quite possible that a change of climate may necessitate a change of food.

One thing struck me during the feeding of my larvæ, and that was that they seemed to be very lazy, inert fellows, preferring to feed on a half-dead leaf to taking the trouble to crawl to a fresh one near at hand. I believe that this eating of half-dry food is injurious, and generally removed the caterpillar, dry leaf and all, to pastures new. But it must not be forgotten that in Dr. Wallace's report it is asserted, that moist succulent leaves do not appear to agree so well with the caterpillar as well grown, fully developed leaves, *even if they should be a little dry.* More experience is required here.

It is perhaps not worth while to go more fully into details in this paper, when the experiments of another season may be productive of very different results; but I may say that, notwithstanding these almost complete failures, I have no doubt that both *Yama-mai* and *Pernyi* will in due time be acclimated in this country, and form another source of wealth for our energetic and enterprising people. If a number of individuals could succeed in raising a few cocoons each, we may, by making a collection from each, succeed in bringing together a number of males and females sufficient to secure a few lots

* A subsequent letter from this correspondent informs me that his moths have come out male and female, and that the larvæ were fed on Red Oak (*Q. rubra*). Food changed twice a week, branches sprinkled daily, and that they were kept at an open window facing the southeast, with a curtain placed so that the early morning sun only, could fall on them.

of fertile eggs, and doubtless caterpillars from these would be healthier, and consequently would feed better, and be less predisposed to disease than those produced from imported eggs.

The great objection hitherto to the cultivation of Cynthia is the difficulty of reeling off the cocoons. As I said before, no difficulty of this kind occurs with Yama-mai; for Mr. J. P. Murray of England, to whom I am indebted for a valuable pamphlet on silk-worms, has succeeded in reeling 250 yards in one continuous thread from this cocoon, and is of opinion that 350 yards may be obtained. This is encouraging, and it would seem very strange if none of our silk manufacturers can discover a plan by which large quantities of this silk may either alone or mixed with other staples, be profitably made up into at least coarse goods for ordinary wear, for umbrella covering, or for a variety of other articles of that nature.

For those intending to make experiments next season with Yama-mai, it is desirable that they should this fall house some young oak trees, so as to be prepared with early food in case of premature hatching of the egg. They should also ascertain the localities of the earliest budding oaks, there being doubtless a considerable difference in the time of early vegetation. It was stated before the Royal Dublin Society in November last, by Messrs. Moore and Andrews, that at Killarney *Q. sessiliflora* came into leaf full a month earlier than any other species.

Over our widely extended country it is scarcely possible that any one species of oak has the advantage universally over all others; but it would be of service to amateur silk-growers, if the botanists would help us on this point by stating what species are earliest in different latitudes.

[Our own experience the past summer with this Japanese Silkworm was very unsatisfactory, and we learn from Dr. Wallace that experimenters met with but poor success in England in 1869, though an Austrian Baron succeeded in rearing 20,000 cocoons.—Eds.]

New Food for Silk-worms.—The *Illustrated Sidney News* (Australia), says that a native shrub has just been discovered both on Phillip Island and the shores of the western port bay, which has proved far better for feeding silk-worms than the Mulberry.

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.

THE BOLL-WORM OR CORN-WORM.—2d ARTICLE.

(*Heliothis armigera*, Hübner).

In number 11 of our first Volume we gave an account of this insect, illustrated by figures. In this Article we stated that it fed in the larva state on the bolls of the cotton plant, on the silk and the soft kernels of roasting ears of corn, and also on green tomatoes and young pumpkins. From the following passage in an Address on Insects, delivered at Vineland, N. J., by that excellent observer, Mrs. Mary Treat of that place, and published in the *Vineland Weekly* of August 21, 1869, it appears that this very same larva also feeds upon the undeveloped tassels of corn and upon green peas; and, as will be subsequently shown, it likewise bores into the stems of the garden-flower known as Gladiolus; and in confinement will even eat ripe tomatoes. Thus it seems to be almost as promiscuous in its tastes as the Stalk-borer (*Gortyna nitela*, Guen.), which burrows in the stalks of the Potato, of the Tomato, of the Dahlia, of the Aster and other garden flowers, of the common Cocklebur and of Indian corn, besides boring into green corn-cobs and eating into green tomatoes and ripe strawberries, and in a single instance in Missouri eating into peach twigs, and in Illinois inhabiting the twigs of the Black Currant.*

This year green peas have been eaten into by a hateful looking worm, and a similar one ate into the staminate flowers of the corn before it tasseled out, commencing their depredations while the tassels were still enfolded in the leaves. I have examined considerable corn, and in some gardens this worm has done much damage. While feeding it is of a green color; but when it comes to full size it turns brown, and goes into the ground to assume the chrysalis form. I already have the moths of the caterpillars that lived upon the peas, and am waiting for those that lived upon the corn to make their appearance, so that I may decide whether they are distinct species. It is a query with me what the second brood of caterpillars will live upon, as green peas and untasseled corn will be out of their reach.

There can be no doubt about the identity of the moth, the larva of which fed upon peas, because Mrs. Treat obligingly forwarded to us in the middle of August specimens actually bred by her from green peas, which differ in no respect from the common type of the Corn-worm moth. Unfortunately, she has mixed together promiscuously the moths bred by her from green peas and those which she subsequently bred from corn-tassels; but at our express de-

*See Amer. Entom., I, p. 206; II. p. 13.

sire she has examined the mixed lot, and informs us that she can detect no difference of any consequence among them. It is very true that this does not amount to a definitive proof that the Corn-worm sometimes feeds on undeveloped corn-tassels as well as on peas; but we have such confidence in Mrs. Treat's perceptive powers as an entomological observer, that we consider it as morally certain that the Corn-worm does so feed.

The fact that the early brood of larvæ, feeding upon green peas and apparently also upon undeveloped corn-tassels, always has the longitudinal stripes so obscurely represented, that in Mrs. Treat's eyes they seemed to be of a uniform green or brown color, is especially interesting and remarkable. Several other such cases are known to entomologists, where one brood of a two-brooded insect differs constantly in coloration from the other brood; and philosophically such observations as these are of the very highest importance, as throwing light upon that mysterious question of the Origin of Species, which is now puzzling so many brains.

It has always been said by entomologists that the Corn-worm or Boll-worm is two-brooded; and in Georgia, according to Mr. Glover, even three-brooded; and moreover we all know that it cannot feed upon hard corn, but only upon such as is in a soft or milky state. Since in our hot summers the ears of corn are developed and matured with most surprising rapidity in the northern States, it always seemed a mystery to us, how two successive broods of the same Owlet-moth could be matured there from green corn in one and the same season. We can now better understand how the corn plant can in northerly regions mature in one summer two broods of corn-worms, and in southerly regions even three; for it would seem that the first brood occasionally feeds upon the green tassel or male flower, and the next broods upon the ear and its silk, which is the female flower. This point is elaborated more fully in the following extract from a letter of Mrs. Treat's to us, dated August 25th, 1869, or four days after the publication of her Address on Insects:

I did not think that this *green* larva, that eats into the peas and the stalks of corn before the latter are half grown, was, as you inform me, this same *striped* boll-worm, that eats into the soft ears of corn. I never found one of these pea-eating, stalk-eating fellows striped off like the one that eats into the ears of corn. The other day I passed through a large field of corn, where the depredations of this worm were visible upon almost every stalk. They had done the work weeks before, eating through the leaves while they were folded around the staminate flowers, before the ears had begun to make their appearance. So I suppose this second brood was just then ready to take the ears. At any rate it is difficult to find an ear free from their depredations. I have several chrysalids of this *last crop*, and noticed that they looked precisely like those of the first, although the caterpillars were marked so differently. This last brood confines its diet more strictly to corn than the first did, which ate into the stalks and flower-buds of the Gladiolus as well as other things; and when confined they would leave the Gladiolus stalks for *ripe* tomatoes which they specially liked.

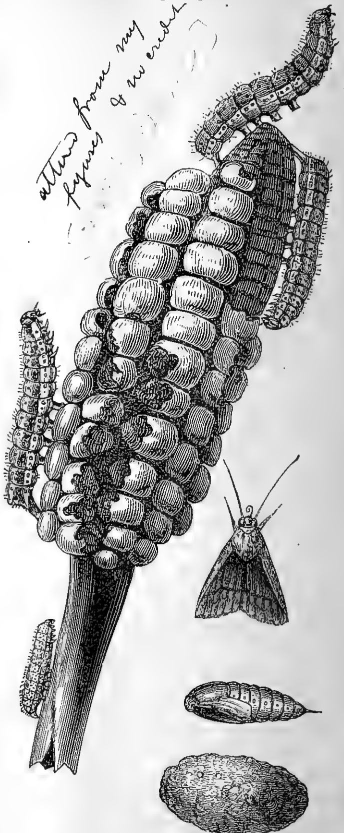
It was formerly supposed that there was but a single larva that burrowed in the young stem of corn, namely the notorious Spindle-worm (*Gortyna zeæ*, Harris). We know now that, at a somewhat later period perhaps in the growth of the corn-plant, the Stalk Borer often bores into the stem of the same corn-plant. And it results from Mrs. Treat's valuable observations, that the first brood of the common Corn-worm most probably does the same, or very nearly the same thing. We have also on hand an undescribed species of Owlet-moth (*Prodenia* near *commelinæ*, Sm. Abb.), the striped larva of which is of nearly the same size and general appearance as that of the Corn-worm, and eats into the heart of the young corn-plant in Central Illinois, besides feeding externally on the leaves. Of this larva we received very numerous specimens from Mr. E. Daggy, of Tuscola, Ill., in July, 1868, with a full account of its habits, and the moths made their appearance towards the end of the same month. In a future article we shall describe and illustrate this new species. There can be but little doubt that, in very many cases, these four larvæ, namely the Spindle-worm, the Stalk Borer, the Corn-worm, and our new species, which we shall take leave to call Daggy's Corn-worm (*Prodenia Daggyi*), have been confounded together; more particularly as the larvæ of almost all Owlet-moths, including the multifarious species of Cut-worms (*Agrotis* and allies), present the same colorational patterns, are very variable in their coloration, and afford but very few strongly marked and reliable distinctive characters.

In those southerly districts, such as South Illinois and Kentucky, where the Corn-worm is a grievous pest to the farmer—since it is now probable that the first brood of this mischievous insect occasionally matures in the undeveloped tassel of the corn-plant—it would possibly pay to go through a field in July and break off and destroy the tops of all corn-plants that appeared to contain one of these borers. If the toppings were fed out immediately to stock, before the worm inside had had time to escape, the forage thus gained would probably pay in good part the expenses of the operation; and by this means the propagation of the 2d and 3d broods, which are the ones that do the real damage to the crop by attacking the roasting ears, would be pretty effectually checked, especially if this system were adopted by a whole neighborhood. We do not profess to more than a general knowledge of Botany; but we strongly incline to believe, that topping a certain percentage of the corn-plants in a field would not in any wise diminish the product of corn; inasmuch as with all plants, such as hemp, cucumbers, pumpkins, etc., which bear the male and female reproductive organs in distinct flowers, a single male flower is sufficient to fertilize a great many females. To northern men, perhaps, topping corn might seem to be very "slow business;" but to Southerners, who are in the habit of plucking off all their corn-blades for fodder every year, it would come quite natural. In any event, we throw out the hint for what it is worth. "Try all things, and hold fast to that which is good."

In 1860—the year of the great drought in Kansas—the corn crop in that State was almost entirely ruined by the Corn-worm. According to the *Prairie Farmer* of January 31, 1861, one county there which raised 436,000 bushels of corn in 1859 only produced 5,000 bushels of poor wormy stuff in 1860; and this, we are told, was a fair sample of most of the counties in Kansas. The damage done was not by any means confined to the grain actually eaten by the worm; but, as we are informed in the same excellent article just now referred to, "the ends of the ears of corn, when partially devoured and left by this worm, afforded a secure retreat for hundreds of small insects, which, under cover of the husk, finished the work of destruction commenced by the worm eating holes in the grain or loosening them from the cob. A species of greenish-brown mould or fungus grew likewise in such situations, it appearing that the dampness from the exuded sap favored such a growth. Thus decay and destruction rapidly progressed, hidden by the husk from the eye of the unsuspecting farmer." We reproduce here, by way of representing the operations of this insect more vividly to the eye, the graphic though somewhat rough figure which illustrated the above Paper in the columns of the *Prairie Farmer;* and we may add that many horses in Kansas subsequently died from disease, occasioned by having this half-rotten wormy corn fed out to them. Of course

[Fig. 29.]

altered from my figures & no credit



it will be readily understood, that the insect here figured in its three stages is the same which we ourselves illustrated in the same three stages on page 213 of our first volume, besides giving two sketches of the egg.

A Long Sleeper.—I had a caterpillar of the Puss Moth brought me by a friend twelve months ago last August: it formed its cocoon a few days after I received it, and has been lying in that state for twenty-one months. This morning the moth made its appearance.—*H. Chalwin in Hardwicke's Science Gossip.*

☞ 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.

GALLS AND THEIR ARCHITECTS—2d ARTICLE.

In our former Article upon this very interesting and instructive subject*, we showed that, 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. We further showed that galls were of the most various sizes, shapes and colors; that the same gall almost invariably grows upon the same part of the same plant, whether that part be the flower, the twig, the branch, the root or the leaf; that for the formation of a gall the combined action of an animal and vegetable organism is absolutely necessary; that 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; that in none of these Families is the gall-making faculty universal, the very same genus often containing certain species that make galls and certain others that do not; and finally that, besides the true Insects, many of the Mites, which are not true Insects, construct galls of no very conspicuous size, shape or structure.

We then went on to state that 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 secondly, by a young larva stationing itself upon a leaf or other part of a plant and irritating its surface with its beak, until a hollow sack is gradually formed, inside which the larva finally develops and propagates. In the former case, when but a single egg is deposited in one place, the larva that develops from that egg forms but a single cell, as in Figures 30, 31, 32 and 35 of this Article, and the gall is then technically said to be "monothalamous," i. e. one-celled; but wherever several eggs are deposited in one place, the larvæ developing therefrom inhabit several cells enclosed in a common envelop, as in Figures 33 and 34 of this Article, and the gall is then technically said to be "polythalamous," i. e. many-celled. In the second group of galls, namely those originated by young larvæ, the inhabitants of the gall, however numerous they may be, always reside promiscuously in the same large cell or hollow.

In addition to the history of the different Galls treated of in our former Article, we will now give a brief account, illustrated by Figures drawn from nature, of several others of our commoner galls, grouping them according to the different Families to which the different gall-makers belong.

*American Entomologist, Vol. I, pp. 101-110.

Galls made by Sawflies.

(Order *Hymenoptera*, *Tenthredo* Family.)

The Willow-apple Gall (*Salicis pomum*, Walsh), represented in Figure 30 is of a greenish yellow color, usually with a bright rosy cheek, and has very much the look of a miniature apple. It makes its first appearance early

[Fig. 30.]

Colors—Pale-green and rosy.

in the spring, on the leaf of the Heart-leaved Willow (*Salix cordata*)—nearly attains its full size by the last of May, when the rosy cheek is already very conspicuous—and is fully matured by the last of July. Internally it is of a fleshy consistence and whitish color like any ordinary apple. But appearances are sometimes very deceptive. Though this gall looks as tempting to the eye as a cherry, it is tasteless and insipid when taken into the mouth. That is, it is tasteless and insipid to us human beings; but no doubt, to the little larva that bores into its substance and feeds throughout its entire larval existence upon its pulp, it offers as relishing a flavor as would a basin of the best Turtle Soup to a hungry Alderman.

The four-winged fly that originates this gall (*Nematus s. pomum*, Walsh) presents very much the appearance of the Imported Currant Worm Fly which we figured on page 16 (Fig. 7, *a* ♂, *b* ♀), except that it is about one-third smaller. We have reared hundreds of them from the gall, and so variable are they both in size and in coloration, that a suite of specimens which by way of experiment we sent to Mr. Norton of Connecticut—an Entomologist who has devoted years of his life to the special study of this particular Family of Insects—were pronounced by him to belong to two distinct species*. Yet they were all bred from the same lot of galls, gathered off the same group of willow bushes, and preserved in the same breeding-vase. Hence we may see how impossible it sometimes is to distinguish species, from the mere comparison of dried cabinet specimens by the closet-entomologist.

The perfect Fly makes its appearance about the middle or latter end of April, when the sexes couple as usual, and the female shortly afterward deposits a single egg in the leaf of the Heart-leaved Willow, or occasionally in that of the Glaucous Willow (*S. discolor*). For cutting the tiny slit, which is to receive the egg, into the substance of the leaf, she employs the small pair of saws which are found at the tail of all female Sawflies, and which we figured from a microscopic inspection of those of this particular species on page 19 (Fig. 10, *a*). Along with the egg she deposits a minute drop of a peculiar poison, through the action of which upon the vegetable tissues of the plant, combined after the lapse of a few days with the hungry gnawings of the young larva that hatches out from the egg, the apple-like gall is called gradually into existence. By the end of July the larva is full-grown, and is then about one-fifth of an inch long, the body of a pale greenish white color and the head pale brown, with the usual lateral eye-spots blackish. Besides the six true or jointed legs in front, it has seven pairs of sham legs (pro-legs) behind, as usual in larvæ belonging to this genus. It generally passes into the pupa state inside the gall, and in the April of the succeeding year the pupa-shell bursts open and the winged fly appears, to reiterate the same old cycle of operations year after year.

If we cut into a great number of these Willow-apple galls early in July, we shall often find a good many of them to contain, not the 20-legged larva of the Sawfly that makes the gall, but a small whitish legless grub very similar to the grub of the common Curculio, but of a much smaller size. In August there is produced from this grub a small Snout-beetle, which we may call the Sycophant Curculio (*Anthonomus sycophanta,* Walsh), about half the size of the common Curculio, and nearly of the same general shape, but of a uniform brown-black color, except that the wing-cases are almost entirely blood-red. This Snout-beetle, is what we have denominated a "Guest-beetle," that is, it does not make a gall for its own future progeny like the Willow-apple Sawfly, but it lays its egg in the immature gall of that unfortunate insect, thus sponging upon the labors of its more industrious compeer for food and lodging for its own offspring. The intrusive egg then hatches out into a minute larva, which has the wonderful instinct to destroy the rightful tenant of the gall, either in the egg or in the early larva state; thereby monopolizing for its lazy self the delicious gall, which the provident Mother Sawfly had intended for her own offspring. The larva of the Sycophant Curculio, when fully fed, changes into the pupa state inside the gall, and in August, as already stated, the winged beetle emerges, destined to pass the winter in the perfect state, and in the ensuing spring to rob another brood of the poor ill-used Willow-apple Sawflies of their own rightful tenements.

"But," it will be asked, "how do you know all this? How do you know that it is not the Sycophant Curculio that is the veritable architect of this gall, and that the Willow-apple Sawfly does not in reality sponge upon the Snout-beetle for food and lodgings, instead of the Snout-beetle, as you assert, sponging upon the Sawfly?" We answer that we have reared numbers of this same Sycophant Curculio, not only from the Willow-apple gall, but from two perfectly distinct galls (*S. desmodioides,* Walsh, and *S. nodus,* Walsh), one of which is peculiar to the Humble Willow (*S. humilis*) and the other to the Long-leaved Willow (*S. longifolia*). Both these two galls produce Sawflies, one of which belongs to the same genus (*Nematus*) as the Willow-apple Sawfly but to a distinct species, while the other one is not only specifically distinct but belongs to a distinct genus (*Euura*). Now, if it is the Snout-beetle, and not the Sawfly, that makes the Willow-apple gall, it must be this same identical Snout-beetle that makes these other two galls on two other species of Willow. But, upon that supposition, we should have the same insect generating three entirely distinct galls, which is physically as impossible as for the same cow to produce indifferently either a calf, a lamb or a pig. Therefore it necessarily follows that our Snout-beetle cannot be a gall-maker, and as we find numbers of them in all their stages in three perfectly distinct Willow-galls, it must be a Guest in each of them. For, as it feeds upon the substance of the gall, and not except incidentally upon the larva that in reality generates the gall, it cannot be a mere Parasite.

Besides the 20-legged larva of the Gall-making

*See the Paper on *Willow Galls* by the Senior Editor in *Proc. Ent. Soc. Phil.* VI. p. 254.

Sawfly, and the legless larva of the intruding Snout-beetle, we shall often find in July in the Willow-apple galls a small lively wriggling 16-legged caterpillar, cross-barred with alternate bands of brown-black and milk white, so as to present quite a harlequin-like appearance. This is another intruder or Guest upon the tenement which rightfully appertains to the Sawfly larva; and it behaves in the same outrageous manner as the Snout-beetle larva, for it is mean and selfish enough to murder its Host either before that Host is born or shortly after he is born. In the May of the succeeding year this pretty banded larva, after having passed through the usual pupal stage, emerges in the form of a small dull-gray moth, with very narrow elongate wings, known as the Willow-apple Tinea (*Batrachedra salicipomonella,* Clemens); and the female moth, after coupling, is then ready to operate upon another crop of Willow-apple galls, and destroy through the instrumentality of its reckless and unprincipled offspring a second generation of poor honest hard-working Sawfly larvæ. This very same moth we have also bred from two perfectly distinct Willow-galls (*S. desmodioides,* Walsh, and *S. rhodoides,* Walsh), both of which grow on the Humble Willow, and the first of which produces a Sawfly while the second produces a Gall-gnat. Hence, precisely in the same manner as we proved that the Sycophant Curculio must be a Guest and not a Gall-maker, we may prove the same thing of the Willow-apple Tinea.

In our first Article on "Galls and their Architects," speaking of the different Guest-insects that are found in galls, we stated (page 109) that some of them were very closely allied to the gall-maker, and some were as different as it is possible to conceive. The two Guest-larvæ that we have already referred to, as found in profusion in the Willow-apple Gall, belong to the latter group; for while the larva of the Willow-apple Sawfly is 20-legged, that of the Sycophant Curculio is entirely legless, and that of the Willow-apple Tinea is 16-legged; and both of these last produce winged insects, which are as different from the Sawfly as a Hawk is from a Pigeon. There is still a third Guest-insect which infests this gall; but this, instead of being widely distinct in all its stages from the true gall-maker, actually belongs to the same genus (*Nematus*) and is of about the same size, though its general color is pale grass-green instead of honey-yellow, and its dark markings are much fewer in number and are very differently arranged. This is the Beggar Sawfly (*Nematus mendicus,* Walsh); and what we took to be its larvæ were 20-legged like the true gall-makers, but differed from these last in being of a pale ash-color with some pale dusky markings on the body, instead of pale greenish-white with no dark markings at all on the body. We also bred another specimen of this same Beggar Sawfly from the same Willow-cabbage gall (*S. brassicoides,* Walsh), that we figured in the First Volume of our Magazine (page 105, Fig. 84). Now, this last gall is the work, not of a Sawfly, but of a Gall-gnat; so that it follows—as in the case of the Willow Tinea and in several other instances which we have put on record—that the very same Guest-insect sometimes infests galls made by insects belonging to the most widely distinct Orders. Of course, it further follows from the fact just stated—as in the case of our other two Guest-insects—that this Beggar Sawfly, being bred from widely distinct galls, cannot be a gall-maker; and as no known Sawfly is parasitic in its habits, it cannot be a Parasite, and must consequently be a true Guest in both the galls which it is known to inhabit.

Besides the above three Guest-insects, there are several Parasites which we have bred from the Willow-apple gall, some of which appear to infest the architect of the gall, while others attack the Guest-insects. But, as our readers are by this time tolerably familiar with the mode in which Parasites attack the various kinds of plant-feeding insects, and as there is nothing at all remarkable in the mode in which these particular parasites operate, we will not occupy unnecessarily the space, which we have to devote to the history of our different Gall-insects, by dwelling further upon this stale subject.

Let us now pause for a moment and consider how complicated is the great tangled web, in which every Animal organism is enveloped, as exemplified in the Natural History of this one apparently insignificant little Sawfly, which is the Architect of the Willow-apple gall. How many millions of men have cast their eyes upon these rosy little apples, that are in certain seasons found in such prodigious abundance on the leaves of the Heart-leaved Willow, without even giving a passing thought to the very interesting questions—"What makes these apples? Why are they so abundant in certain seasons and so scarce in others? What prevents them from increasing to such an extent, as to entirely eat up all the leaves on every Willow bush belonging to this particular species upon which they occur, and thereby killing the entire bush? What prevents them from swarming to this extent upon every such willow-bush throughout the length and breadth of North America, and thereby annihilating the species from off the face of the earth? Female Sawflies usually lay at least two or three hundred eggs. What prevents this Sawfly from increasing a hundred fold every year, till, at this rapid geometrical rate of progression, it becomes as numerous as the house-flies in a grocer's store in the latter part of the summer?" Our readers can, we think, now answer all these questions without difficulty. Truly says Charles Darwin, that with every organism on the face of this earth there is a perpetual Struggle for Existence. The Willow-apple Sawfly is striving every year to fulfil the great law of Nature—"Increase and multiply and replenish the earth." In its efforts in this direction it is more or less checked and controlled every year by the three distinct Guest-insects that, in order to occupy for their own greedy purposes the snug little house and home of the poor gall-making larva, and feed on the delicate pulp provided with such careful forethought for its use, put it ruthlessly to death. The Guest-insects, as well as the Gall-maker, are in their turn checked and controlled by different Parasites. And all of them, whether Gall-makers, Guest-insects, or Parasites, are preyed upon to a very considerable extent—especially after they have left the gall and are flying around for purposes of love, or food, or enjoyment, or the search of suitable homes for their future progeny—by Cannibal Insects, by various Birds, and by different kinds of insect-devouring reptiles, such as Snakes, Frogs and Toads, or insect-devouring Mammals such as Skunks, Shrew-mice and Bats. Can any one wonder that, in so complicated a system as this, the balance occasionally oscillates a little one way or the other? To us, instead of our being astonished at the fact that certain insects—such for example as our Northern Army Worm—occur in certain years in exorbitant profusion, it seems like a perpetual miracle that so very few disturbances occur in the great System of Nature; and that species do not continually eat up and annihilate species, year after year and century after century, till at length there remains nothing but one vast Bloated Bug, who will finally die of starvation, because all his compatriots have been already swept from off the face of this green earth, and not a single bug now remains for him to prey on.

It is very true that, in the case of Insects, we do not know for certain that many distinct species may not have been annihilated by natural causes within the last few centuries; for entomology, as a science, dates only from the days of Linnæus or about a hundred years ago; and, even at the present day, what we know about the Natural History of Insects is but as a drop in the ocean when compared with the vast illimitable unknown. But let us recur to those larger animals, such as Birds, which are only about one-fiftieth as numerous in species as Insects, and consequently do not cover so extensive a field; and which, from their far larger size, have been studied much more carefully than Insects, and for a very much longer time. So far as we are aware, there are but two Birds—the Dodo of the Mauritius and the Great Auk of the Arctic Regions—which within the memory of man have become extinct; and even these, as there is every reason to believe, have perished from off the face of this earth, not through the attacks of any of the inferior animals, but through the unintermitting persecutions of Man. Reasoning, therefore, from analogy we may infer that scarcely any insects have become extinct within historic times; for, from their generally very minute size and their occurring usually in such immense swarms, it is impossible for Man, with all his boasted pre-eminence as the King of the Creation, to wage a war of extermination against them. So true is it that—within the very limited epoch reached by human records—although the individual is annually dying, the species maintains a permanent foothold.

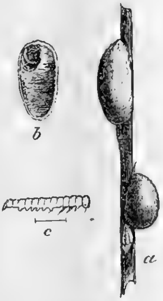
The Great Author of Nature took as much pains—and we desire to be understood here as speaking in no irreverent spirit—in making the apparently insignificant little Sawfly whose history we have been tracing, as in building up a Whale or an Elephant. Its habits are to the full as interesting and instructive as those of any of the larger animals. Its structure, when examined with the aid of proper glasses, is seen to be as complicated and wonderful even as that of Man himself. And yet the majority of mankind go through life with their eyes shut to this little microscopic world of wonders, and look down with contempt, forsooth, upon those who have devoted half their years to the study of such trifling little objects! Why? Simply because a Bug is smaller than a Bear! As if it could ever be beneath the dignity of the Creature to study those organisms, which it did not derogate from the power and majesty of the Creator to call into life by the fiat of his almighty will! As if, because a whale is a thousand times as bulky as a man, therefore its history is a thousand times more worthy to be carefully investigated than that of man himself! As if, because Daniel Lambert weighed one thousand pounds, therefore he was philosophically a far more interesting object than the poet Pope, who weighed only about a hundred pounds! As if a sunflower was more deserving of our admiration than an orange blossom! As if we ought to make a pet of a vulture rather than of a mocking-bird!

The Willow-egg Gall.

(*Salicis ovum*, Walsh).

On examining particular bushes of the Heart-leaved Willow in the middle of the summer, and especially such as seem to be in a diseased and stunted condition, it will be noticed that many of the twigs have one or more round or oval swellings, from one-third to one-half an inch in length, projecting from their sides, such as are shown in Figure 31. If we cut into these swellings in the summer, their internal substance will be found to be whitish and fleshy like that of an apple; but by the autumn the apple-like pulp is converted into a reddish-brown sponge with many transverse fissures at right angles to the axis of the twig. By dissecting down at any time to the original surface of the twig, a longitudinal slit will be discovered, about one-fifth of an inch long, manifestly produced by the saws of the female Sawfly that generates this gall. This species of Sawfly comes out in the middle of the preceding April, and produces the future gall by depositing in the slit which she has cut with her saws a single egg, accompanied by a drop of the peculiar poison secreted by each species of gall-producing Saw-flies. If one of these swellings, known as the Willow-egg gall, is cut into about the last of August, the larva that has hatched out from the egg will often be found imbedded in the slit, and already more than one-tenth of an inch long, of a pale-yellowish color, with three pairs of true legs and seven pairs of pro-legs, and a very pale dusky head having the usual lateral dark eye-spots. At this date, and even as late as the first week in the succeeding March, many full-sized galls will be found to be still solid and uneaten by any larva, no doubt from the egg having failed to hatch out; thus proving that it is the drop of poison deposited along with the egg by the mother Sawfly, and not the action of the jaws of the young larva produced from the egg, that generates the gall. About the middle or latter end of the April of the following year after the formation of the gall, the perfect Fly, after passing through the usual pupal stage, bursts forth from the interior, which by this time has been reduced to an irregular hollow filled with the larval excrement or "frass," as it is technically termed. This fly belongs neither to the genus (*Nematus*) which has four submarginal cells (Fig. 7, page 16), nor to the genus (*Pristiphora*) which has three submarginal cells with the cell next the body very long (Fig. 11, page 20), but to another genus (*Euura*) which has three submarginal cells with the cell next but one to the body very long. But as we have dwelt at considerable length upon this somewhat dry subject on page 20 of this volume, we need not repeat here what we have already said. With the exception of this curious difference in the structure of the wing-veins, the figure of the Native Currant Worm Fly, given on page 20, will represent with sufficient accuracy the Willow-egg Sawfly (*Euura S. ovum*, Walsh), except that the general color of the latter is honey-yellow in the female and greenish white in the male, instead of black in both sexes, and except that the size is a little smaller and the body much less robust.

[Fig. 31.]



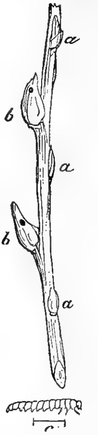
Colors—Green, with pale-brown scales.

The Willow-bud Gall.

(*Salicis gemma*, Walsh).

For a long time, in the course of the winter and early in the spring, we had noticed here and there on particular twigs of the Humble Willow (*Salix humilis*)—a dwarf species which grows on the driest uplands—particular buds preternaturally enlarged in the manner shown in Figure 32 at *b b*, buds of the natural size being represented at *a a a*. On examining into such enlarged buds, we found most of them reduced to a mere hollow shell, with a round pin-hole in it, through which some larva must have made its exit. A few such buds, however, which had evidently not been depredated on by any insect, instead of being filled by the normal downy embryo leaves, contained a homogeneous grass-green fleshy matter. Here then was a riddle to be solved! What made these buds swell so prodigiously? What converted the organized downy leaves into a mass of green pulp showing no signs of any organization? What insect had disappeared through the pin-hole, probably in order to transform under the surface of the earth? For several years the enigma remained without solution. At length we came across several of these Willow-bud galls early in October, and discovered that at that period they contained many of them a single 20-footed worm (Fig. 32 *c*, enlarged), of a greenish-white color, the head tinged with dusky and with the usual dusky eye-spots. From other galls the worm had already escaped to go underground; and in a few, in which the egg had apparently failed to hatch out, the whole interior was a solid mass of grass-green pulp; while in all the others the gall itself was a mere hollow shell containing more or less "frass." Manifestly, therefore, from the characters of the gall-inhabiting larva, it would produce some kind or other of Sawfly. But to what species and to what genus would this Sawfly belong? Here was another riddle to be solved! We therefore placed several of the unbored galls in a breeding-vase, with some moist earth at the bottom of it. Shortly afterwards the larvæ bored their way out, and burrowed a few inches underground, where they spun a thin whitish silken cocoon, to which many particles of dirt were externally attached. In the succeeding May there came forth from under the earth of the breeding-vase both sexes of the Willow-bud Sawfly (*Euura s. gemma*, Walsh), which proved to belong to the same genus as the Willow-egg Sawfly, but to differ from that species by the size being considerably smaller and by the general color being black instead of pale.*

[Fig. 32.]



Color: That of the natural bud.

Since, as has been already stated, a few Willow-bud galls may be found in October and in the following winter and spring, unbored by any larva, but of the full natural size, we may draw the same conclusion as to this gall being caused exclusively by the drop of poison deposited along with the egg by the Mother Sawfly, as we previously drew in the case of the Willow-egg gall. Philosophically, this is an important point to be cleared up; because certain authors have supposed that it is nothing but the hungry gnawings of the gall-making larva which in all cases originate the gall. It may be so, and we ourselves believe that it is so, with certain groups of gall-makers, such for example as the Gall-moths; but with these two species of Sawflies, and probably with all gall-making Sawflies and Gallflies, it most certainly is not so.

There is a Guest Gall-gnat (*Cecidomyia orbitalis?* Walsh) which infests the Willow-bud gall; but we know but little of its Natural History, and probably the reader has already heard as much as he cares for about the habits of that very remarkable group—the Guest-insects.

*In his Paper on our N. A. Sawflies (*Trans. Amer. Ent. Soc.*, I, p. 79), Mr. Norton considers *Euura s. gemma*, Walsh, which he somewhat carelessly misprints twice over as "*Euura genuina*, Walsh," to be a mere synonym of his previously described *Euura orbitalis*. Respecting the natural history of this so-called species of Mr. Norton's he tells us absolutely nothing, except that several specimens, received by him from nobody knows whom, are said to have been captured on some species or other of the twenty-two willows found in the United States. In his description of *orbitalis* he endeavors to comprehend both sexes under the same general formula; and in this futile attempt, as almost invariably happens in species where the sexes differ considerably, the description itself becomes indefinite, inaccurate and sloppy. Thinking as we do of the "Law of Priority," we hold that a name based upon a complete and accurate description which distinguishes the two sexes, especially when it is accompanied by the full history of the habits of the species in all its stages, ought to take precedence of a name based upon a previously published sloppy description, and upon an unknown number of mere cabinet specimens received from Tom, Dick and Harry, the larval history of which specimens must remain unknown until the day of judgment.

TOADS IN GARDENS.

The *Journal des Connaissances Medicales* states that of late years French horticulturists have followed the example of the English ones, and peopled their gardens with toads. These reptiles are determined enemies of all kinds of snails and slugs, which it is well known can, in a single night, destroy vast quantities of lettuce, carrots, asparagus, etc. In Paris toads are sold at the rate of two francs fifty centimes a dozen. The dealers in this uninviting article keep it in large tubs, into which they plunge their bare hands and arms, without any fear of the poisonous bite to which they are supposed to expose themselves. Toads are also kept in vineyards where they devour during the night millions of insects, which escape the pursuit of nocturnal birds and might otherwise commit incalculable damage on the buds and young shoots of the vine.

SCIENTIFIC SYMBOLS.

We repeat, for the benefit of our new subscribers, that 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.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund, and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

ONION MAGGOTS—*Franklin, N. Y., Aug. 6, 1869.*—In April I sowed in my garden twenty-five square rods to onions. In June I discovered that the onion maggots were working badly in this patch, and threatened to destroy the whole crop. I determined to fight them, and accordingly I provided myself with a trowel and two convenient vessels which I could carry in one hand; and having filled one vessel with young onions (thinnings), I passed over the whole patch, digging out every affected onion and setting a sound one in its place. The affected onions were put into the empty vessel, and afterwards destroyed by burning. This work was twice repeated, though the first transplanting was much more onerous than the second and third. I have reason to believe that the maggots travel from one onion to the next in the row, especially in the early part of the season; for I have observed that if an affected onion is left in the ground, the next one to it will soon be destroyed, and so on. Later in the season, when the onions become larger, there is no necessity for the maggots to travel from one to another, and consequently at that period they do less mischief than in June when the onions are small. JAS. H. PARSONS.

CHINCH BUGS—*Summerfield, St. Clair county, Ill., June 5th,* 1869.—If our farmers would only take your paper, they would in six months' time make one thousand per cent. on the investment. Just as you predicted in No. 9 of the ENTOMOLOGIST, the recent heavy rains that we have had, from the 30th of May to the 4th of June, have operated splendidly upon the Chinch Bugs. A few days before these rains, if you kneeled down and looked near the roots of the wheat, every particle of root seemed to be full of life. Now it is quite a different thing. Last year I had a piece of corn adjoining a wheat-field. As soon as the wheat was cut, the great army of Chinch Bugs immediately commenced moving upon the corn-field. In spite of ploughing and ditching, I lost three acres of corn out of the fifteen that there was in the whole piece. COL. FRED. HECKER.

CICADA NOTES—*Lancaster, Pa., Aug.* 14, 1869.—Quite a number of Periodical Cicadas were both seen and heard round here the present season. A single specimen dropped from an oak tree on a gentleman's coat-sleeve, in Duffey's Park, near Marietta, in this county, on the 4th of June, but it made its escape before I could secure it. In this city quite a number were seen and heard, and also a few secured in localities where they were most abundant last year. One gentleman dug up quite a number of the pupæ in the early part of May, which he used for fishing-bait, and they did not differ in any respect from those that were dug up, or came up of their own accord, last season. I regret that I had not an opportunity to observe whether the two kinds, that appeared last season, made their appearance this season. The prunings which some fruit trees received last season, on the whole, were much more beneficial than injurious. With all my efforts, I have not yet been able to learn of a single well-authenticated case of Cicadas stinging any one in this county, although there had been some idle, irresponsible reports to that effect. So the whole subject, so far as this locality is concerned, will, I suppose, have to be postponed for sixteen years at least. Let others meet the question then, for in all human probability I shall have run out all my sands of life before that period arrives. S. S. R.

GIGANTIC ROOT-BORER—*Plattsburg, Mo., Oct.* 13, 1869.—The Gigantic Root-borer, as described on page 231 of your first volume, is destroying a good many of our apple grafts, set last spring. The root not being large enough for them to work inside of it, they eat out about one-third of the bark and hollow out the rest of the root. Our nursery is on prairie, broken in the fall of 1867. I am told there are a great many of them plowed up in breaking prairie. I cannot, I think, be mistaken about the identity of the species, for your figure is so good that I recognized it immediately, and they differ greatly from the common White Grub so called—the larva of the May Beetle. WM. C. HOLMES.

[We have an article already written which will throw some light on this matter, but which will perhaps be crowded out of this number.—EDS.]

TENT-CATERPILLARS—*Old Westbury, L. I., N. Y., June 6th,* 1869.—How we do enjoy the immunity from caterpillars' nests this spring! We have only seen five of them this year; in other years we have often destroyed more than five hundred. ISAAC HICKS.

Notes on the Tarantula-killer — *Glenwood, Mo., Sept.* 25, 1869.—I send you herewith a specimen of an immense blue wasp with golden glossy wings, which I found a few days ago in my vineyard at Glenwood, and which from its unusual size attracted my attention. It flew quite sluggishly, and after alighting on a cluster of grapes, immediately proceeded to cut into a berry with its enormous nippers, sinking its head well into the fruit. It would then attack another berry, and, if left unmolested, would soon destroy an entire bunch of fruit. What was to me most remarkable, I observed that the wasp was attended or followed by a bevy of four or five honey bees, who seemed to understand that the wasp made an incision for their benefit into the delicious fruit. Chas. Peabody.

[The wasp is a specimen of the Tarantula-killer (*Pepsis formosa*, Say), which we illustrated at Figure 101 of our First Volume. It will be remembered by most of our readers, that the Tarantula of Texas (Vol. 1, Fig. 91) was last year found in several different parts of Jefferson County, Missouri, and it is gratifying to know that it is there accompanied by the same enemy which attacks it in Texas. We have lately obtained two additional specimens of this Tarantula-killer, the one captured at Hematite and the other at Eureka in Missouri; and it is an interesting and suggestive fact that, while the Tarantula was captured in 1868, its deadly Digger-wasp enemy should be found the year following; for they are both of very rare occurrence so far North.—Eds.]

Grassshoppers—*Franklin, N. Y., Aug. 6th*, 1869.—As to grasshoppers, we have fewer this season than last. After five weeks in the hayfield, I noticed at length during the last week one small green grasshopper, and perhaps half a dozen small brown ones not over half an inch in length; I also found in my garden a single rusty-brown road grasshopper. The scarcity of this scourge of the West, and of other common insects, makes it somewhat expensive raising poultry here this year. But "it is an ill wind that blows nobody any good." The haymakers find it a great relief this season not to be obliged to pull off their shoes every five minutes in order to pick out the smashed grasshoppers.

Jas. H. Parsons.

Horse-hair Snakes!—*Washington, D. C.*—Horse-hair worms are often found attached to aquatic plants in brooks or ponds in the Northern and Middle States, and probably also in all the States. D. L. Dix.

Grape Curculio—*Haw Hill, near Springfield, Ill., Sept.* 13, 1869.—A great many of our grapes were destroyed this year by a curculio. In the latter part of July I gathered a handful—mostly Concords—which had been punctured, and placed them in a glass tumbler, with some sandy soil in the bottom. In about a week I found in the glass several small white larvæ. On the 27th of August I found in the soil two small beetles, which I send you.

You professional entomologists must not think too hard of the farmers and fruit-growers, for paying so little attention to the study of insects and the making of collections; for my experience is that, with all my conveniences in the way of collecting-apparatus and preserving-cases and the like, I can make very few additions to my cabinet; and as for noting habits, &c., with any great degree of accuracy, it is almost impossible for any one whose time and mind are otherwise much employed, to watch and record an insect through its most important changes.

That the circulation of the American Entomologist may be extended, until it is known and appreciated in every reading farmer's household, is the sincere wish of

Phil. M. Springer.

[The beetle sent was the Grape Curculio (*Cœliodes inæqualis*, Say), described and figured by the Senior Editor in his First Annual Report.—Eds.]

Army Worm—*Hannibal, Mo., Sept.* 29, 1869.—The Army-worm disappeared from this section of country in five days after you left (June 12th). In the corner where we saw them thickest, being oppressed with famine behind and our entrenchment in front, they turned on and devoured each other, the larger eating the smaller, and sometimes two making a meal off one and the same unfortunate. I did not see them kill each other. It may be that the living attacked only those already dead. I saw live ones carrying about dead ones in their jaws like a pig with an ear of corn, as though to avoid the others and to enjoy their meal alone. There were a gallon or two of heads left in that corner. A. E. Trabue.

Royal Horned-caterpillar—*Washington, D. C., Sept.* 30, 1869.—This remarkable caterpillar, figured in No. 12 of your first volume, was found this season, and has been found heretofore, in the District of Columbia; while the perfect insect has been secured by Dr. Eastman—the Physician of the Government Hospital for the Army and Navy. D. L. Dix.

THE SKUNK AS A TOMATO-WORM DESTROYER —*St. Joseph, Mich., Oct.* 14, 1869.—I want to speak a word for the much abused animal we all so much dislike to come in contact with, known sometimes as the "Essence-pedlar," but more commonly as the Skunk. My tomato vines (some four hundred) and potato vines, with the exception of the "Peach Blows," were covered this year with the Tomato Worms. The tomatoes, although repeatedly cleared of them, were finally completely stripped of foliage; but yet the worms held on. All at once the worms began to disappear, and soon there was not one to be seen. At the same time, there were found numerous holes among the plants, and fresh ones every day, about 6 inches deep, dug by some animal. I had often noticed in the evening the odor of a skunk, and the tracks of that animal were distinctly seen. Now I am satisfied that the skunk has proved himself a valuable friend, for by his well known habit of feeding on worms, grubs, etc., he has completely rid my grounds of this nuisance, even burrowing in the earth for the worms that had gone into winter quarters. We say most emphatically, don't kill the skunks.

L. P. HASKELL.

BAD BUGS—*Charleston, Coles county, Ill., June* 8, 1869.—The prospect for a large crop of apples is growing beautifully less every day. Trees that were loaded with young fruit two weeks ago, are now in many instances almost stripped by the Codling Moth. The Cut Worm [White Grub?—EDS.] is doing much mischief in our county; especially is this the case in fields that have recently been meadows. One man had eighty acres of corn cut smooth by this insect last week; in other cases the amount destroyed ranges from five acres up to forty. The Army Worm (genuine) and the Chinch Bug walk through our meadows and our fields of corn and of spring wheat, as if they owned the soil, making clean work as they go.

M. C. MCLAIN.

WHITE GRUB FUNGUS—*Vineland, N. J., Aug.* 11, 1869.—In the spring of 1865, when I was botanizing in Benton county, Iowa, I saw great numbers of the common White Grub with the curious fungus growing out of their mouths. There were literally thousands of them scattered over quite a tract; yet in no instance did I ever see one of these "sprouts" with the least shade of green color; they were all of them white at the base, gradually deepening into a purple color at the tip.

MRS. MARY TREAT.

ARMY WORMS—*Benton, Franklin county, Ill., June* 10, 1869.—The Army Worms are destroying about all the pastures in this vicinity, but confine themselves chiefly to redtop grass; they have also destroyed considerable corn. I have myself twenty acres of redtop; and unless they stop working upon it inside of two weeks, it will be entirely ruined for hay. There are a few stalks of timothy and clover among my redtop; but the worms have eaten all the redtop from around them, and left the timothy and clover scarcely touched. The worms confine themselves to the lowest part of my pasture, where the grass is the largest. They work upon the grass along the edge of the field of winter wheat, but the wheat itself they have not up to this time touched. A. A. HYATT.

THE PLUM CURCULIO—*Grayson, Ky., Sept.* 27, 1869.—Touching the Plum Curculio, I may state that, having occasion to build a hen-house where a plum tree stood, instead of removing the tree I enclosed the trunk and trimmed off the branches to the roof. Result: I have for two years past gathered perfect fruit from the tree, and have not found one specimen stung by any insect. A temporary hen-coop constructed under another plum tree the past season partially succeeded, whilst the trees not so protected lost all their fruit by the curculio.

JOHN C. BAYLER.

ASPARAGUS BEETLES—*Old Westbury, L. I, N. Y., June 6th*, 1869.—I learn from the asparagus-growers of Oyster Bay, that the Asparagus Beetle—owing to their carelessness in not cutting everything down and making clean work last year—is becoming more plentiful again. But I believe they can keep the insect under control, if they are not too careless. The culture of asparagus is largely increasing in the vicinity of New York, and large quantities are again reshipped to Boston and neighboring cities. ISAAC HICKS.

SCARCITY OF THE CORN-WORM AND BOLL-WORM—*Pickens' Station, Miss., Aug.* 1, 1869.—The Corn-worm—the species which eats the silk and the end of the ear, and which you say is the same as the Boll-worm—is quite scarce this year, and singularly enough the Cotton Boll-worm is also very scarce. A very warm dry spell, about the time corn silked out last year, is supposed to have killed them. Last year the ravages of the Boll-worm were fearful in this section. This year we hope for a little rest, and exemption from the scourge.

B. H. BRODNOX.

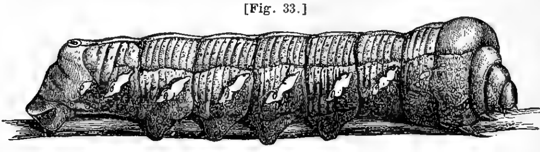
INSECTS INJURIOUS TO THE GRAPE-VINE: No. 3.

The Achemon Sphinx.

(*Philampelus achemon*, Drury.*)

We herewith represent another large Grape-vine-feeding insect, belonging to the great *Sphinx* family, and which may be popularly known as the Achemon Sphinx. It has been found in almost every State where the Grape is cultivated, and also occurs in Canada. It feeds on the American Ivy (*Ampelopsis quinquefolia*) with as much relish as on the Grape-vine, and seems to show no preference for any of the different varieties of the latter. It is, however, worthy of remark, that both its food-plants belong to the same botanical Family.

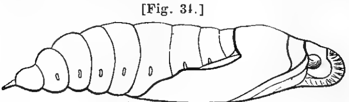
[Fig. 33.]



a

Colors—Green, yellow and brown.

[Fig. 34.]

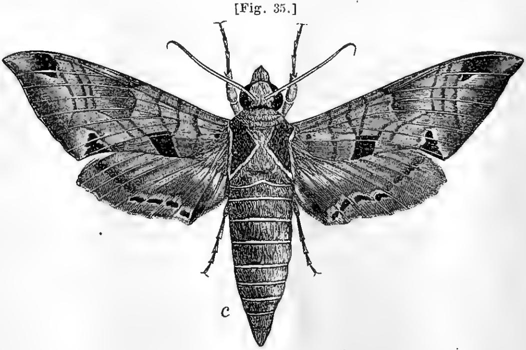


b

Color—Brown.

The full grown larva (Fig. 33 *a*) is usually found during the latter part of August and fore part of September. It measures about 3½ inches when crawling, which operation is effected by a series of sudden jerks. The third segment is the largest, the second but half its size and the first still smaller, and when at rest the two last mentioned segments are partly withdrawn into the third as shown in our figure. The young larva is green, with a long slender reddish horn rising from the eleventh segment and curving over the back, and though we have found full grown specimens that were equally as green as the younger ones, they more generally assume a pale straw or reddish-brown color, and the long recurved horn is invariably replaced by a highly polished lenticular tubercle. The descriptions extant of this worm are quite brief and incomplete. The specimen from which our drawing was made, was of a pale straw color which deepened at the sides and finally merged into a rich vandyke-brown. A line of a *feuille-morte* brown, deep and distinct on the anterior part, but indistinct and almost effaced on the posterior part of each segment, ran along the back, and another line of the same color continuous, and with its upper edge fading gradually, extended along each side. The six scolloped spots were cream-colored; the head, thoracic segments and breathing-holes inclined to flesh-color, and the prolegs and caudal plate were deep brown. The worm is covered more or less with minute spots which are dark on the back but light and annulated at the sides, while there are from six to eight transverse wrinkles on all but the thoracic and caudal segments.

[Fig. 35.]



c

Colors—Pink, gray and brown.

The color of the worm, when about to transform, is often of a most beautiful pink or crimson. The chrysalis (Fig. 34 *b*) is formed within a smooth cavity under ground. It is of a dark shiny mahogany-brown color, shagreened or roughened, especially at the anterior edge of the segments on the back.

Unlike the Hog-caterpillar of the Vine, described in our last, this insect is everywhere single-brooded, the chrysalis remaining in the ground through the fall, winter and spring months, and producing the moth towards the latter part of June. We rather incline to believe however that

*The synonyms for this insect are *Sphinx Crantor*, Cramer and *Pholus crantor*, Hubner. The genus *Philampelus*—meaning literally "fond of the vine"—was erected by Harris to include this and another species, which also feeds on the Grape-vine and which we shall describe in our next number. We adopt Harris's name as being appropriate, and best known to the American reader.

there may be exceptions to the rule in southerly latitudes, and that in such latitudes it may sometimes be double-brooded; for we have known the moth to issue near St. Louis during the first days of August, and have this very year found two worms in the same locality as late as the 25th of October, neither of which was quite full grown, though the leaves on the vines upon which they were found had almost all fallen.

In Rock Island county, in North Illinois, out of three larvæ that we had in our breeding-cages in 1868, every one of them developed into the moth state in the first few weeks of the August of the same year; and we heard several years ago of one larva developing the same season in the adjoining county of Henry. Apparently such premature development of *Sphinx* moths is a well-known occurrence among the different European species. For Chas. Darwin remarks that "a number of moths, especially *Sphinx* moths, when hatched in the autumn out of their proper season, are completely barren; though the fact of their barrenness is still involved in some obscurity."*

The moth (Fig. 35 *c*) is of a brown-gray color variegated with light brown, and with the dark spots, shown in our figure, deep brown. The hind wings are pink with a dark shade across the middle, still darker spots below this shade, and a broad gray border behind. We once had an excellent opportunity of observing how it bursts open the chrysalis shell, for while we were examining a chrysalis, the moth emerged. By a few sudden jerks of the head, but more especially by friction with the knees of the middle pair of legs, it severed and ruptured the thin chrysalis shell, and the very moment the anus touched the ruptured end, the creamy fluid usually voided by newly-hatched moths was discharged.

We have never found any parasite attacking this species, but its solitary habit and large size make it a conspicuous object, and it is easily controlled by hand, whenever it becomes unduly numerous upon the grape-vine.

* See *Variation of Animals and Plants, etc.*, II, pp. 157–8, English Edition, and the references there given in the foot-note.

CURCULIOS AND ROSE BUGS.—The Vineland (N. J.) Horticultural Society, having determined, if possible, to rid their place of these pests, offered eight prizes to those who should destroy the greatest number during the season. It appears by the reports of the committees to award the prizes, that the parties applying for them had destroyed 9,289 curculios and 120,000 rose bugs.—*Country Gentleman*.

SWARMS OF LADYBIRDS.

We learn from English exchanges, that countless millions of Ladybirds have appeared in Kent and Sussex, and have even extended their flight to London. Streets, roads, buildings and dresses of persons moving in the open air were covered with them. At Ramsgate, Broadstairs, and surrounding country, they were so thick that the ground seemed covered with red sand; and children, for amusement, gathered them in paper bags in large quantities, and in one place men were found shoveling them through the gratings into the sewer. These insects appeared to be moving westward, and they presented a front of several miles. It is currently believed that these immense swarms came from the Continent across the channel; but Mr. T. Southwell, of Norwich, in the October number of *Hardwicke's Science Gossip*, argues (and we think rightly) that they could not possibly have crossed the channel. It appears that both the beetles and their larvæ had been unusually numerous in England in gardens, and more especially in hop-yards, where they saved the crop which was once threatened by the Hop-louse, and it is easy to understand that their onward movement in search of food, would cause them to congregate on the sea shore. Strangely enough, we cannot glean from any of the accounts that we have seen, what particular species it is that has thus swarmed, or whether more than one species is concerned.

THE SQUASH BUG DOES NOT TOUCH THE WHITE BUSH SCOLLOP.

Our friend, Major E. S. Foster of Bushberg, Mo., planted, last spring, side by side, two long rows of squash vines, the one row consisting entirely of the "Hubbard," and the other of the "White Bush Scollop" variety. We were much surprised to find, that while the common Squash Bug (*Coreus tristis*, DeGeer) had almost entirely ruined the plants of the former variety, and had furnished almost every leaf with a batch of eggs, it had left untouched those of the latter sort. Should further experience prove that this immunity is general, the knowledge of the fact will be invaluable to the squash-grower, for the Squash Bug is one of his very worst enemies.

We will state right here, for the benefit of those who are troubled with this pest, that one of the most effectual methods of destroying it, is to lay down pieces of board along the rows. During the night time the bugs congregate underneath the boards, and in the early morning they may be killed by wholesale.

SCIENTIFIC PHRASEOLOGY.

[Translated from *Le Naturaliste Canadien*, No. 4.]

Every day we hear formal complaints made against the nomenclature adopted in science; and yet this nomenclature is a necessity. Doubtless, we ought not to misuse it, and make a silly display of words which will be understood by but very few persons, especially if we are writing to popularize science. For above all things, a writer ought to express himself so as to be understood. Every time, therefore, that we are treating of a plant or an animal that has a popular name, we must not hesitate to make use of that name, because we may be sure that it will be understood more surely and more readily than any other. But we wish that the scientific name likewise should be always mentioned along with the popular name, in order to avoid mistakes. For it will sometimes happen that such and such a plant, or such and such an animal, bears such and such a popular name in one place, and such and such another popular name in another place. Thus, in the district of Trois-Rivieres, humble-bees (*bombus*) are "humble-bees," and horse-flies, (*tabanus*) are "horse-flies." The people there know perfectly well how to distinguish the one from the other. They know that the humble-bee has got four wings and a sting in its tail, and that the horse-fly has only got two wings, and has no sting in its tail. On the other hand, in the district of Quebec, people do not know how to distinguish between these two genera. No matter whether the insects have but two wings, or whether they have as many as four wings, they are called indiscriminately "horse-flies." We may judge then if it is easy to understand folks when they talk of the manners and habits of one animal, and use the name that properly belongs to another animal. For instance, if a Quebec man proceeds to say at Trois-Rivieres that "he has found a nest of horse-flies" in the ground, and that there was a good deal of honey in it, the Trois-Riveres folks will laugh in his face, because there they know very well that horse-flies do not make any nests, and that they never produce any honey. Just such a mistake as this was actually made not long ago by the *Gazette des Campagnes*. Speaking of the Flea-beetles (*Haltica*) that infest cabbages, turnips, etc., and intending to say that, when spent ashes were thrown upon them, they might be seen jumping in all directions, instead of calling them "Flea-beetles," which would have been correct and would have been understood by the whole world, it called them "Plant-lice" (*aphis*)! What an absurd blunder! the idea of plant-lice jumping! Why, there is still more difference between a flea-beetle and a plant-louse than there is between a dog and a turkey. Now, if in speaking of this bird, whatever name we chose to give it, we were to say that, as it walked about, it lifted up one leg and wetted every post that it came across, judge what astonishment we should produce! Both in the district of Quebec and in that of Trois-Rivieres, they commonly call the little yellow beetles with black stripes (*Diabrotica vittata*) which infest the leaves of melons, cucumbers, pumpkins, etc., by the name of "plant-lice," and the flea-beetles by the name of "earth-fleas." In fact, in Canada we are almost completely bare of recognized popular names for animals, especially so far as regards insects, of which there are scarcely a score that have special names appropriated to them. Our compatriots who speak the English language are scarcely better off in this respect than we are. Amongst them, almost all insects are called either "flies" or "bugs; it is "the cucumber-BUG," "the potato-BUG," "the rose-BUG," etc., and a man that hunts after all kinds of insects is nothing but a "BUG-hunter."

HOGS vs. CURCULIO.

[From the Rural New Yorker, Aug. 28, 1869.]

In the *Rural* of July 31, L. L. Fairchild calls for experience and facts under the above heading.

Here is my experience, which satisfies me that hogs are the best plum cultivators:—I bought a farm that had some twenty very fine plum trees on it. In spring they would bloom full, and when the fruit was about half grown all would fall off, which was really vexing. I threatened to grub them up as cumberers of the ground; but this was protested against, saying may be they will ripen next year.

I wanted a lot to feed hogs in, and the plum orchard was right where I wanted them, but I was persuaded to fence in only a part of the trees, which was done in early spring. All the trees blossomed full, and when the fruit was about half grown the trees out of the hog lot played their old tricks; all the fruit fell off; but the trees in the hog lot did not shed their fruit, though the hogs had almost dug them up by the roots. The trees grew well and the fruit also, and every tree had to be propped up. The fruit ripened, and was excellent.

The next season the fence was changed, and run around all the rest of the trees in the orchard, and all included in the hog lot without a protest. All produced ripe fruit for years.

This was only accidental; but it is experience, and to me is proof enough. I advise all, in setting plum trees, to set them where they can have their hogs run. Others have tried the experiment, and can testify to the same results. Hogs will save plums. G. G.

UNION CITY, Ind., 1869.

☞ The popular reader, who generally objects to the long crack-jaw scientific names of insects, will find that we always when possible give the plain English names of such insects as we have occasion to refer to, adding in a parenthesis (printed *in italics*) the Latin or scientific names. To the entomologist, these last names are an absolute necessity, because it is only through the use of them that he is enabled to know, with the requisite scientific precision, what particular species we are talking about. To the general reader, they need not be any stumbling-block; for he will always find that in our columns he can skip over the parenthesis that contains them, without interfering in any wise with the full and complete meaning of the sentence. By adopting this plan we aim to suit as far as possible both parties; namely, the scientific man who is never satisfied unless he knows the scientific appellation of the insect that we are treating of, and the popular student, who is generally annoyed and disgusted by stumbling upon Latin phraseology which he neither understands nor cares about.

BEDBUGS.

In New York, the other evening, there was a learned dissertation on the subject: "Bedbugs, and their remarkable tenacity of life." One asserted of his own knowledge that they could be boiled and come to life. Some had soaked them for hours in turpentine without any fatal consequences. Old Hanks, who had been listening as an outsider, here gave in his experience in corroboration of the facts. Says he: "Some years ago I took a bedbug to an iron foundry, and dropping it into a ladle where the melted iron was, had it run into a skillet. Well, my old woman used that skillet pretty constant for the last six years, and here the other day she broke it all to smash; and what do you think, gentlemen, that 'ere insect just walked out of his hole, where he'd been layin' like a frog in a rock, and made tracks for his old roost up stairs. But," added he, by way of parenthesis, "by George, gentlemen, he looked mighty pale."—*New York Republic.*

INSECT DESTROYING ASSOCIATION.

Associations of this kind are being started in New Jersey, with a view to the more successful cultivation of apples, pears, peaches, etc. The object is to adopt a plan which will work to clear orchards of injurious insects of every kind. It is held that if every fruit-grower will adopt some established means to rid his orchards of these insects, and sedulously and honestly attend to it, the culture of fruit will be made a certainty and the profitableness of it will satisfy the reasonable demands of every one. It is farther held that all farmers and cultivators of fruit will be forced to come into the measure on the principle of self-interest: that is, they must either destroy the insects or fail of success.—*Germantown Telegraph.*

ON OUR TABLE.

Besides our regular exchanges we find on our table the following publications, which we are obliged to notice in the most curt manner, on account of our limited space:

RECORD OF AMERICAN ENTOMOLOGY FOR THE YEAR 1868, Edited by A. S. Packard, Jr., M. D., Salem, Mass.—Naturalists' Book Agency.—A work that has been greatly needed by American Entomologists. This initiatory number is gotten up in good style, and is just what it purports to be, namely, a Year Book of the Progress in American Entomology during 1868. Dr. Packard has made a good beginning, and we hope he will keep the ball rolling from year to year. No one interested in the study of insects can afford to do without this Record. Price $1.00.

THE CANADIAN ENTOMOLOGIST.—We are pleased to learn of the success of this little contemporary. It will be found of great interest and value, to the American as well as to the Canadian entomologist. The number of pages of reading matter has lately been doubled, and each issue is embellished by a cover. As with our own journal, the second volume of the *Canadian Entomologist* is to end with the year 1870. Subscriptions received by the editor, Rev. C. J. S. Bethune, Credit, Ontario, Canada. Price $1.00.

TRANSACTIONS OF THE AMERICAN ENTOMOLOGICAL SOCIETY, Vol. 2, No. 3.—This number has been unexpectedly delayed by difficulties in preparing the plates. It is freighted with interesting and invaluable matter, and we only wish that the Entomologists of this country would support it more liberally. (See advertisement on the inside of cover.)

SEVENTH ANNUAL REPORT OF THE STATE BOARD OF AGRICULTURE OF THE STATE OF MICHIGAN.—Lansing, Mich, 1868. From Sanford Howard, Secretary.

THE AMERICAN EXCHANGE AND REVIEW.—A monthly Miscellany of Useful Knowledge and General Literature. Philadelphia. $3.00 a year.

THE OCCIDENTAL.—A monthly Journal of Popular Homœopathy. St. Louis, Mo. $1.00 per annum.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION FOR THE YEAR 1868.—Washington, D. C. From the Secretary.

PROCEEDINGS AND TRANSACTIONS OF THE NOVA SCOTIAN INSTITUTE OF NATURAL SCIENCE, Vol. II, Part II. Halifax, N. S.

The Butterflies of North America—with Colored Drawings and Descriptions, by Wm. H. Edwards. Published by the American Entomological Society, Philadelphia.—Part 4 of this magnificent work has been received. It contains descriptions and plates of *Argynnis leto*, Behr., *Colias Eurytheme*, Boisd., *Colias Keewaydin*, n. sp. *Thecla ontario*, Edwards, and *Limenitis Weidemeyerii*, Edwards; together with the continuation of the Synopsis. Price $2.50. Orders should be sent to E. T. Cresson, 518 S. Thirteenth St., Philadelphia, Pa.

Annals of Bee Culture for 1869—Being a Bee-keeper's Year Book—From D. L. Adair, Editor, Hawesville, Ky. This is a very neat little pamphlet of 64 pages, and treats of many subjects that are of vital importance to the Bee-keeper. As the editor well remarks, a publication of this kind is needed to collect in small and convenient compass the advancements now being made each year in the art of Apiculture. We wish Mr. Adair success, and would suggest that a full index of the subjects treated of, would add value to the next number. Subscriptions received by the editor. Price 50c.

Illustrated Catalogue of Grape Vines—Isidor Bush & Sons, Bushberg, Mo.—The best catalogue of the kind that we ever knew to be published in the West. It is well illustrated and full of practical information. The authors have evidently endeavored to make it valuable and interesting regardless of cost. They clearly have no special axe to grind, and in their efforts to establish a reputation as Grape growers and propagators, we wish them every success.

Good Health — A monthly Journal of Physical and Mental Culture. Boston, Mass. $2.00.

The Rural Carolinian, Charleston, S. C.—A new monthly agricultural Journal of excellent appearance. $2.00 a year.

Missouri Dental Journal—A monthly devoted to the specialty of Dentistry. St. Louis, Mo. $3.00 a year.

Second Annual Report of the State Board of Agriculture of Nebraska.—From R. W. Furnas, President.

The Minnesota Monthly.—D. A. Robertson, Editor and Proprietor, St. Paul, Minn. $2.00 a year.

Condition and Doings of the Boston Society of Natural History. Boston, 1869.

Grape List of the Cliff Cave Wine Co. of St. Louis, Mo., C. W. Spaulding, President.

A Guide to the Study of Insects—By A. S. Packard, Jr., M. D., Salem, Mass. Parts VII, VIII and IX of this work have been received, and are equal in value to those parts which have preceded them. Part VII concludes the Diptera and commences the Coleoptera. Part VIII continues the Coleoptera, and Part IX contains the Hemiptera and commences the Orthoptera. Each Part 50 cents. We shall probably notice this work at greater length when once completed.

Illinois Horticultural Society.—We have received from the Secretary, W. C. Flagg, a circular calling attention to the Fourteenth Annual Meeting of this Society, which will be held at the Court House in Ottawa, on Tuesday, Wednesday, Thursday and Friday, December 14th, 15th, 16th and 17th, 1869, commencing at 9 o'clock A. M. on Tuesday.

The Chronicle—University of Michigan. $2.50 a year.

American Journal of Homœopathic Materia Medica—Philadelphia. $2.00 a year.

Beloit College Monthly—Beloit, Wisc. $1.50 a year.

ANSWERS TO CORRESPONDENTS.

Notice.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain, whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

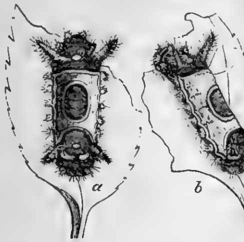
Locust Borer—*Julian Bagby, Cedar Fork, Mo.*—The prettily banded black and yellow beetle, found on your Locust trees, is the common Locust Borer (*Arhopalus robiniæ*, Foerster.) It is a ♀ specimen, and as the ♀ of this species is absolutely undistinguishable from the ♀ of *A. pictus*, Drury, which attacks Hickory, and comes out in June, we are guided simply, in our decision, by the fact of your finding it on Locust in the month of September. (See on this point our answer to W. W. Butterfield on page 148 of Vol. 1.)

Cocoon found on Carpet—*A. A. Hilliard, Brighton, Ills.*—The cocoon found embedded in your parlor carpet, was that of some unknown moth. The larva was doubtless a vegetable-feeder, and had simply crawled into your room and made use of the carpet to help build its cocoon. All manner of material is used by different caterpillars for the external covering of their cocoons, not excepting hard wood.

Directions for making boxes for preserving insects.—If "Subscriber," St. Louis, Mo., will send us his name and address we will send him printed directions.

Saddle-back Larva—*Geo. T. Cost, Fairfield, Green Co., Ohio.*—The worms you found on Indian Corn, devouring the blades and silk, are the larvæ of the Saddle-back Moth (*Empretia stimulea*, Clem.)—the same as that spoken of on page 32 of our last number

[Fig. 36.]



Colors—Green, brown and cream-color.

under the head of STINGING LARVÆ. As we are ever and anon receiving this species, we present herewith figures of it for future reference. (Fig. 36, *a*, back view; *b*, side view.)

Silk Spiders—*Geo. Howe, M. D., Ponte a la Hache, La.*—The two spiders whose habits you so well describe, are not sexes of the same species, but are very distinct one from the other. The very dark brown species with the upper part of the head-thorax and sundry spots on the abdomen silvery white, and the three hind pairs of thighs for the most part of a very light brown, is *Epeira riparia*, Hentz. The light brown species, chiefly characterized by the long narrow abdomen and the two tufts or whorls of short dark stiff hairs on each of the six larger legs; but which also has the head-thorax more or less silvery-gray above, and the abdomen regularly spotted and speckled with the same color, is the *Nephila plumipes* of Knoch. It is the species on which Prof. B. G. Wilder made some experiments with a view to obtain textile material from its spinnerets, and you will find it figured in the Proceedings of the Boston Society of Natural History, Volume X, page 210.

C. W. Spaulding, Kirkwood, Mo.—The spider sent by you is the same *Epeira riparia*, Hentz, spoken of above.

Entomological Works—*S. W. Cowles, Olisco, N. Y.*—There is no work that we know of, either published or in course of preparation, which gives the specific characters of all our N. A. beetles. The descriptions of very many will be found in Say's *Entomology*, a work in two volumes, containing the Entomological writings of Thomas Say, and published in 1859 by Balliere Bros. of New York. Very many other descriptions are scattered through the Proceedings of the Boston Society of Natural History, of the Philadelphia Academy of Natural Science, and of the American Entomological Society, while still others have been published by European authors. Neither Melsheimer's catalogue, nor Le Conte's which is yet unfinished, will help you to identify the species. Morris's *Synopsis*, so far as it goes, will help you to determine many of your Lepidoptera. The *Eudryas* larva which feeds on *Epilobium coloratum*, or Purple-veined Willow-herb, is in all probability *E. unio* Hübner, though we cannot tell positively unless you send specimens, either living or in alcohol.

Insects named—*A. H. R. Bryant, Clarksville, Texas.*—The two large brown cocoons formed by immense green worms which you found on your apple tree, but which afterwards fed on "Red Haw," are the cocoons of the Cecropia Moth (*Attacus Cecropia*, Linn.) The large hairy ant-like insect of a black color, with the forehead, upper part of thorax, and two broad bands on the abdomen, of a deep blood-red, is *Mutilla coccinea*, Linn. That with wings is the ♂ and that without wings the ♀. You say that "the former appears to be nearly always on the wing, and the latter as much so on the run, stopping ever and anon to grabble for food." You further remark that they are commonly called "Cow-killers," but do not give any reason. Have they ever been known to kill cows? The sting of the ♀ is said to be very severe; but as with all Wasps, Bees and Ants, the ♂ has no sting at all!

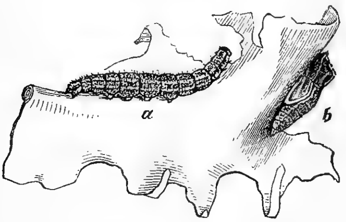
A new Bee Enemy—*F. Brewer, Waynesville, Mo.*—The flattened larva which you caught in the act of eating a bee near a hive is the larva of some Ground-beetle. The pitchy black horny plates above, the softer whitish lower surface with various sized shiny black spots, the 4-jointed antennæ and *maxillary palpi*, the 2-jointed *labial palpi*, the exarticulate cercus springing from each upper side of the terminal segment, the stiff anal proleg, but above all, the 2-jointed lobe of the maxillary palpi—all indicate its CARABIDOUS nature. We suspect it will produce some species of *Harpalus*, and if we succeed in breeding it we will inform you of the fact, and at the same time illustrate this larva. We doubt whether it would show any preference for the honey-bee over other insects. The Ground-beetles are voracious and general feeders, and will eat almost any soft-bodied insects they can get hold of.

Thousand-legged Worms—*J. W. Merchant, Carthage, Miss.*—None of the Thousand-legged Worms are known to be poisonous, though there is an enormous Hundred-legged Worm (*Scolopendra castaneiceps*), which is found in the southerly regions of N. A. and may possibly occur in your State, the bite of which is very poisonous. This last species is 6 or 7 inches long, of a dark green color with a chestnut-colored head; and it has 42 legs, or 21 on each side. We have handled with impunity hundreds of times all the different kinds, whether of the Thousand-legged or of the Hundred-legged Worms, which we meet with out North; and one of the former group (*Julus marginatus*, Say), is over three inches long. We have this summer found two distinct thousand-legged worms (*Julus & Polydesmus*) burrowing into strawberries near Rock Island, Ills., but only in very small numbers. The idea of their being "poisonous" is entirely without foundation. We should have no more objection to eat a strawberry with one of them inside it, than we have to eat a cherry with a Curculio larva inside it. And yet those that we found in strawberries were as long as those that your neighbors met with in the same situation, namely, one inch.

Caterpillar of Cecropia Moth—*A. R. Bowman, Kirkwood, Mo.*—The gigantic green caterpillar sent by you, was the larva of the Cecropia Moth (*Attacus Cecropia*, Linn.). See page 26 of last number under the same head.

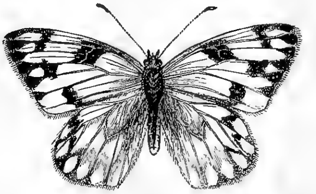
Cabbage Worms—*Wm. C. Holmes, Plattsburg, Mo.*—The green worm which has been destroying the cabbages in your neighborhood, is in all probability the larva of the Southern Cabbage butterfly (*Pieris protodice*, Boisd.) At least we know that this is the most common insect found on the cabbage in your locality; but as you describe it simply as a "green worm," we cannot decide positively, because there are several other worms of a green color which also attack that plant. At Figure 37 *a*, we represent the larva of the Southern Cabbage butterfly; at *b* the chrysalis, and at Figure 38 the ♀ butterfly. The ♂ differs remarkably from the ♀, and in our next number we shall present his portrait, together with an illustrated account of the two other common butterflies belonging to the same genus (*Pieris*), which at present attack the Cabbage in different parts of the United States. One of these, known as the Rape Butterfly (*Pieris rapæ*, Schrank), has of late years been introduced from Europe, and has been rapidly spreading westward from the Atlantic seaboard, while the armies of the Colorado Potato Bug have been marching in the opposite direction, towards the sea. Thus, while there is every reason to believe that we shall, in a few years' time, give to our Eastern brethren the greatest and most destructive insect foe of the Potato; they seem determined to pay us back in our own coin, by sending forth into the West the greatest of cabbage pests. The only known way to destroy these Cabbage worms is to pick and kill them either by hand or chicken-power, and to catch and kill the butterflies which are constantly hovering over the plants during the sunshiny days of summer and autumn.

[Fig. 37.]



Colors—(*a*) Greenish-blue, yellow and black; (*b*) light bluish-gray.

[Fig. 38.]



Colors—Black and white.

The Rape Butterfly—*Jos. E. Chase, Holyoke, Mass.*—The two white butterflies which were taken in Bangor, Maine, are ♂ and ♀ of the Rape Butterfly (*Pieris rapæ*, Schrank), a recent importation from Europe. We shall illustrate this insect in our next issue.

Bad packing—*H. C. Beardslee, Painesville, Ohio.*—The green larva, marked with brown at each end of its body, and with a large round brown patch on the middle of its back, and also with sprangling horns at each extremity which sting like a nettle, is the Saddle-back caterpillar (*Empretia stimulea*, Fig. 36). It feeds on a great variety of trees, besides Indian corn on which you found it, and last year we met with it on Sumac. The *Sphinx* larva found on grape-vine is probably *Chærocampa pampinatrix*, otherwise known as *Darapsa myron*, a full account of which appeared in the last No. of our Magazine; but when it reached us, owing to your bad packing, it was dead, dried up and rotten. Larvæ ought by rights to be packed in a tight tin box, along with some of their appropriate food, which as well as the larvæ will then keep moist. But if you are obliged to pack them in a pasteboard box, which always suffers the moisture to evaporate from it, it is making matters ten times worse to put in dry paper to fill up the empty space instead of moist leaves. If correspondents only knew how much bad packing added to our labor in identifying insects, they would take a little more pains to follow the printed directions, which have been repeatedly inserted in the ENTOMOLOGIST. To recognize insects, when in the condition in which they frequently reach us, is as difficult a task as to recognize a corpse, after it has been afloat for three long summer months in the waters of the Mississippi.

"Grand Daddy Long-Legs"—*Wm. R. Howard, Forsyth, Mo.*—The long-legged Spider, which is commonly known in your vicinity by the above name, is doubtless some species of *Phalangium*; but as there are some fifteen or more described N. A. species, we could not properly refer the species you speak of without seeing specimens. These long-legged spiders are likewise popularly known as "Harvest-men" and "Grandfather Gray Beards" in some parts of the country. They all have similar habits, being carnivorous and seizing their prey very much as a cat seizes a mouse; but they differ from other spiders in that they bodily devour their victims, instead of sucking out their juices. The fact then, of your one night noticing a "Daddy Long-legs" pounce upon a Honey-bee, which happened to come near it, is not to be wondered at. Yet it may be considered as an exceptional occurrence, and we should advise you to encourage, rather than destroy these long-legged spiders, because they are known to devour great numbers of Plant-lice, and Mr. Arthur Bryant, of Princeton, Ills., has found them devouring the larva of the Colorado Potato-bug.

Borer in Apple Twig—*G. C. Brackett, Lawrence. Kansas.*—The borer in the apple twig sent is not, as you suppose, the larva of the Apple-twig Borer (*Bostrichus bicaudatus*, Say), which bores into the twigs in the beetle state only; but is evidently the larva of some long-horned beetle. It resembles in every respect the larva of the Parallel Longhorn (*Elaphidion parallelum*, Newm.), which we have bred from both apple and plum twigs, and it will in all probability produce that beetle. The hole at the axis of the leaf-bud, which connects by a burrow through a side-shoot, with the main chamber in the twig where rests the larva, was evidently made by that larva while younger. The Parallel Longhorn bears a very close resemblance to the Oak Pruner (*E. villosum*, Fabr.), which you will find figured on page 98 of Harris's Injurious Insects.

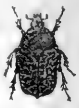
Grape-vine Leaf-galls—*W. T. Heildrup, Barrisburg, Pa.*—The grape-galls you send are the same as those which we figured on page 248 of our first volume. In each freshly-formed gall you will find from one to four orange-colored mother-lice, a number of shining oval whitish eggs of very minute size, and often a number of young six-legged larvæ scarcely bigger than the eggs, and of the same whitish color. Almost as soon as the larvæ hatch out, they stray off through the partly open mouth of the gall on the upper surface of the leaf, and found new galls either on the same or on a younger leaf. After a time, and when their stock of eggs is exhausted, the mother-lice die; and the galls inhabited by them then gape widely open at their mouths and become gradually flattened and obliterated. Thus, upon a grape-cane, the galls upon the oldest leaves will be empty, while those on the young thrifty ones will be swarming with inhabitants; and as fresh leaves put out, these are successively "occupied and possessed" by the enemy. The gall is formed, as with all those constructed by Plant-lice, by Bark-lice, or by Mites, by one or more young larvæ stationing themselves on the upper surface of the leaf, and irritating it with their pointed beaks until it bulges out in an unnatural hollow, inside which the larvæ remain. Finally, as the larvæ grow to maturity, the hollow becomes a fleshy green sack, the mouth of which is almost closed up. The mother-lice then lay eggs, and the same old cycle of phenomena is repeated again and again, till winter sets in.

These galls are peculiar to the wild Frost Grape (*Vitis cordifolia*) of which the Clinton is a cultivated variety, and are not found upon the Northern Fox Grape (*Vitis labrusca*) from which our tame Catawba, Isabella and Concord are derived. This accounts for the latter varieties not being infested by these galls. Perhaps the most effectual remedy would be to give up growing Clintons for a crop; but if you do grow them there is no known remedy but to pluck off the infested leaves and burn them. The old leaves, with empty galls, may just as well be left on the vines.

Maple-worms—*H. K. Vickroy, Champaign, Ill.*—It is often said that the foliage of our maples is entirely exempt from the depredations of worms. To a certain extent this is true, but it is not universally true. We have known maples badly stripped by the striped green larva of one of our most beautiful moths (*Dryocampa rubicunda*), and there is a large larva covered with silky yellow hair and with five slender pencils of black hairs projecting from among the yellow ones, which generally feeds on maple leaves and produces a fine gray moth (*Acronycta americana*). The gigantic apple-green larva, as big as a man's thumb, which you found feeding on Silver Maple (*Acer dasycarpum*) is that of the same *Polyphemus* moth, which we figured in No. 7 of our first volume; and we have received it from a variety of other quarters as infesting different kinds of maple, though the books do not record the fact of its inhabiting this genus of trees. You remark that you have also found the larva of the *Cecropia* moth feeding on maples; and this larva too we have lately received from several other sources as feeding on the same trees upon which it occurred with you, and in some instances stripping them bare when of small size. It is remarkable that, in the case of this larva also, the books are equally silent on the subject of its being ever found on maples.

Melancholy Chafer in Apples—*John F. Fulton, Petersburg, Ills.*—The beetle which you find quite frequently boring a hole in your apples is the Melancholy Chafer, (*Euryomia melancholica*, G. & P.) herewith illustrated (Fig. 39.)

[Fig. 39.]



Colors—Black-brown and whitish.

Worms boring in Cucumbers—*W. B. Ransom, St. Joseph, Mich.*—The worms which suddenly made their appearance the forepart of September, boring into your cucumbers and musk-melons from the outside, are evidently—judging from your description—the same species mentioned on page 31 of our last number under the same heading. As stated in that paragraph, they produce the Neat Cucumber Moth (*Phacellura nitidalis*, Cram.)

Lilac Borer—*T. J. Freeman, Bethany, Mo.*—The 16-footed yellowish-white worm, which has been boring into and destroying your lilac bushes, was dead when it reached us, but we have little doubt that it was the larva of a moth which is well known to attack the Lilac, and which was named *Ægeria* [*Trochilium*] *syringæ* by Harris. We have ourselves never bred this moth, but a ♀ specimen is in our possession which was bred from Lilac by our friend Charles Sonne, of Chicago, and which had bored through the heart of a branch over an inch through. This insect is closely allied to the common Peach-borer and still more closely to the old-fashioned Grape-borer. We should recommend the application of soft soap to the trunks and larger limbs of your lilac bushes in the early part of the season, to prevent the ♀ moth from depositing her eggs. Still, we have but faint hopes that soap would produce this very desirable result; for although this substance, when applied about the last of May, affords perfect security against our two common Apple Borers, which are Beetles, we have experimentally ascertained that it affords no protection whatever against the common Peach Borer, which is a Moth, not a Beetle, and as we said just now is closely allied to your Lilac Borer.

Burying Beetles—*Jos. H. Osborn, Oshkosh, Wis.*—Your boys "having killed a striped snake about two feet long, were surprised on looking for it the next day to find half its length in the earth. Upon pulling it out they noticed two of these bugs, which had evidently dug the hole and drawn the snake in. The snake was left about a foot from the hole, and the next day was found drawn back into the hole its whole length, the hole having been extended so as to admit of it." The two beetles sent were ♂ and ♀ of the Margined Burying-beetle (*Necrophorus marginatus*, Fabr.) which is one of our most common species. The burying-beetles all have the habit of burying dead animals, such as birds, mice, snakes, etc., and two or three of them will often accomplish prodigious feats of this kind in a given time, when their small size is taken into consideration. Their direct object in thus burying such carrion is the multiplication of their kind, by providing food for their young; but indirectly, in their character of scavengers, they are of great benefit to man by ridding the atmosphere of that which would pollute his nostrils and threaten his health. They should never be ruthlessly destroyed.

The large brown snout-beetles, speckled with white, which you shake from your plum trees along with the common Curculio, are *Hylobius stupidus*, Sch.

Wireworms in Potatoes—*W. R. Shelmire, Toughkinamon, Penn.*—The elongate, cylindrical, horny, mahogany-colored worms nearly an inch long, that bored up so badly your crop of Mercer Potatoes, are a very common species of wireworms. We have reason to believe that this particular kind produces a Click-beetle known as *Melanotus incertus*, Le Conte. There are scores of different kinds of Click-beetles, and on page 49 of our first volume you will find one of them (Fig. 50), and by the side of it the larva from which we bred it (Fig. 51). Most of them breed in rotten wood; but there are a few that devour living vegetable matter and are great pests to the farmer, especially in newly-broken land. In such land we have known them to destroy the young corn-plants to a grievous extent, gnawing laterally into the stem just under the surface of the ground.

Your neighbor is quite right in saying, that if these worm-eaten potatoes are used for seed next year, they will produce wormy potatoes, that is to say, provided you plant potatoes with the wire-worms still in them. For these wire-worms live several years in the larva state, and having six good legs of their own they would readily migrate from the infected potato-sets on to the young growing potatoes. You must not suppose, however, that wire-worms could breed wire-worms; for it is not till the larva has developed into the Click-beetle that it becomes capable of propagating its species. Sowing six bushels of salt to the acre is said by one of the best farmers in England, Alderman Mechi, to destroy all the wire-worms in the salted ground. There are no doubt plenty of yours remaining in your old potato ground; for this species does not by any means feed exclusively on potatoes. On the contrary, it is a very general feeder, and we have met with it in all kinds of situations, for example, in an asparagus bed, with no potatoes growing within ten rods distance. We know of no mode but hand-picking to destroy the wire-worms in your potatoes, so that the potatoes can be used for seed. It is, as you remark, a singular but by no means an unprecedented fact, that these insects took the Mercers and did not touch the Goodrich potatoes that were growing alongside. The Colorado Potato Bug and the striped Blister-beetle are equally select in their tastes. Other such cases were collected by us on page 160 of our first volume.

Insects named—*J. F. Waters, Springfield, Mo.*—The insects found on apple are as follows: No. 1 is the larva of some small moth. It closely resembles that of the Rascal Leaf-crumpler (*Phycita nebulo*, Walsh), but is evidently distinct. No. 2 is a species of *Limacodes* or slug-caterpillar, totally unknown to us. If we breed the perfect moth we will report further. No. 3 is the larva of *Chariesterus antennator*, Fabr., a bug chiefly distinguished by the terminal half of the third joint of its antennæ being somewhat ovally dilated and flattened. The mature bug looks very much like the larva you sent, except that it has wings.

Girdled Pear Twigs—*T. A. Throp, Troy, Ills.*—The nine pear twigs were, as you rightly suppose, amputated so neatly by the beetle which you send. This beetle is a large (♀) and rather dark variety of the common Twig-girdler (*Oncideres cingulatus*, Say), of which we gave an illustrated account on page 76 of our First Volume.

Insects named—*E. T. Dale, Yellow Springs, Ohio.*—The insects came in fair condition. No. 1 is *Dicœlus dilatatus*, Say. No. 2, *Pterostichus adoxus*, Say. No. 3, *Bradycellus dichrous*, Dej. No. 4, (3 specimens) are all different forms of *Anomala varians*, Fabr. No. 5, *Anomala binotata*, Schön. No. 6, *Chrysochus auratus*, Fabr. No. 7, *Hippodamia glacialis*, Fabr. We have found this species the present year preying on the eggs of the Colorado Potato Bug, and in consideration of its good services, we honor it by adding its "photo" (Fig. 40) to our album of friendly bugs. No. 8, *Hippodamia parenthesis*, Say. No. 9, *Galeruca notata*, Fabr. No. 10 same as 4 & 5. No. 11, *Alindria cylindrica*, Geoff. No. 12, *Uloma impressa*, Melsh. No. 13, which you say "is from Georgia, where it is called the 'Cabbage bug,' and where it is found by thousands on cabbage and turnip plants," is *Strachia histrionica*, Hahn, an account of which with figures we shall shortly publish. No. 14, *Euryomia melancholica* G. & P. (See Volume 1, Figure 23). No. 15, which "feeds and deposits its eggs on the leaves and young twigs of Sumach (*Rhus glabra*)" is *Blepharida rhois*, Forster, which we referred to in our first volume, page 235. No. 16, *Pterostichus sculptus*, Lec. No. 17, *Toxotus cylindricollis*, Say. No. 18, *Harpalus erythropus?* Dej. No. 19, *Harpalus pennsylvanicus*, De Geer. No. 20, *Anomala lucicola*, Fabr. (Dark var.) No. 21, same as No 5. No. 22, same as No. 4. No. 23, *Serica vespertina*, Say. No. 24, *Strangalia lineola*, Say. No. 25, *Strangalia famelica*, Newm No. 26, *Hetoemis cinerea*, Oliv. No. 27, *Stenocorus villosus*, Fabr. No. 28, taken on *Rhus toxicodendron*, is *Saperda puncticollis*, Say = *trigenimata*, Randall. No. 29, *Acmæodera pulchella*, Hbst. No. 30, *Leptura nitens*, Forst.

[Fig. 40.]

Colors—Orange, red, black and cream-color.

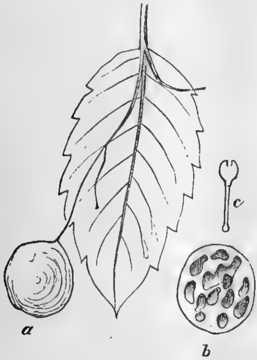
Tomato-Feeding Worm—*A. C. Davis, Farina, Ills.*—The greasy grayish worm, characterized chiefly by a series of triangular black spots along the back, each segment with two spots, both of which are edged on the outside with a white line, while there is an indistinct light line between them (Fig. 41) and a much more distinct one along the breathing-holes at each side—is the larva of a moth which may be known by the popular name of the Spider-wort Owlet Moth (*Prodenia commelinæ*, Sm. and Abb.) This moth has the front-wings variegated with gray, brown and yellowish-white, and the hind wings pure white with the extremities of the nerves and the outer border dark brown. We have bred this moth from worms which fed with equal relish on Cabbage and Tomato, while Mr. Abbot found it on Liver-wort and Pea. It may therefore be considered a very general feeder. The species varies greatly in appearance both in the larva and perfect states. The worms are found full-grown as early as the fore part of July, and the moths issue from the latter part of that month to the latter part of September.

[Fig. 41.]

Cocoons of Ichneumon Flies—*Carrie Mitchell, South Pass, Ills.*—The mass of little white cocoons on the large Tomato worm which you send are formed by the larvæ of a small parasitic Ichneumon Fly (genus *Microgaster*), and the flies had mostly issued on the way hither. (See Figure 15 in our last number).

Gall on Spotted Touch-me-not—*Prof. A. N. Prentiss, Cornell University, Ithaca, N. Y.*—The succulent green globular galls, which you find on the Spotted Touch-me-not (*Impatiens fulva*), and which contain numerous deep orange colored larvæ, have been briefly described (*Cecidomyia impatientis*, O. S.) by Osten Sacken, but the gall-gnat is as yet unknown. The larvæ went into the ground soon after their receipt, and we hope to obtain the fly from them in due time. Succulent galls perish so easily that they cannot well be preserved, so we have made the accompanying drawing

[Fig. 42]



Colors—Green and orange.

(Fig. 42) of this Touch-me-not gall, *a* showing the entire gall, *b* a cross-section, with the cavities in which lie the larvæ, and *c* the breast-bone of the larva highly magnified. This breast-bone is almost clove-shaped, as shown in the figure. For the benefit of the rest of our readers we quote that part of your letter which refers to the color and growth of the gall:

I have examined a number of galls very carefully, including some in their fresh state some time ago, and always find some touches of color, orange usually—in some instances quite bright—on the end of the gall opposite the stem, but the prevailing color is green. I judge the greater part of the gall is composed of the stem immediately under the flower. The position of the bract would indicate this. But I find on the end of the gall where the flower should have been, a number of *foliaceous plates*, which are not easy to account for except they be regarded as abortive remains of the flower. These plates are the colored part of the gall.

Unknown Larvæ—*J. M. Harrold, Salem, N. J.*—The small white wooly worms which "in proportion to their size will afford a larger 'staple' than either a Cotswold or a Southdown," are the larvæ of some moth. They were dead when they reached us, and we shall not be able, in consequence, to breed the perfect insect. They may possibly be the young larvæ of the Rabbit Moth (*Lagoa opercularis*, Sm. & Abb.) spoken of on page 29 of our last number, in answer to H. A. Green of your State; but we incline to believe that they belong to a closely allied species (*Lagoa pyxidifera*, Sm. & Abb.)

Blood-sucking Cone-nose—*D. B. Watson, St. Louis, Mo.*—The bug sent by you is the Blood-sucking Cone-nose (*Conorhinus sanguisuga*, Le Conte.) See Vol. 1, Fig. 74.

Eggs on a Grape-cane—*J. Cochrane, Havanna, Ills.*—In no one of their four stages are insects so difficult to identify as in the egg stage. The reason is simple. There are so few characters to distinguish one egg from another; and moreover, but very few species are known and described in the egg state. We can often identify a squashed beetle or a squashed moth; but a squashed egg is almost always beyond our abilities. Hence the row of eggs attached to a grape-cane, which you send us wrapped up in paper and enclosed in your letter, without any other protection from the heavy hands of Uncle Sam's P. O. clerks, might just as well have been kept at home. We really are tired to death of continually repeating to our correspondents —besides our standing "Notice" to that effect—that specimens should be enclosed in some kind of box or other, in order that they may reach us in recognizable order. Is there no drug-store at Havanna? Are there no gun-caps for sale there? or do the druggists there retail their pills, and the gunsmiths their gun-caps, loose over the counter and without any package to hold them? Do pray, Mr. Cochrane, try and do better for the future!

Gregarious Willow Worms—*G. C. Brackett, Lawrence, Kansas.*—The pale yellow worms—marked with three slender black lines along the back, and three other black lines each side, but characterized chiefly by two black warts close together on the top respectively of the fourth and eleventh segments—which you found feeding on your "New American Weeper," are the larvæ of the American Spinner (*Clostera Americana*, Harr.) These worms are gregarious, remaining closely huddled together, in swarms of twenty or more, within a sort of cocoon formed of leaves. They are found on poplars as well as on willows, and seem to be especially partial to the common cottonwood. You will find an illustrated account of this insect in Harris's Injurious Insects.

Caterpillars named—*G. W. Copley, Alton, Ills.* —The worms that have been so common, folding up the leaves of the Black Locust, are the larvæ of the Tityrus Skipper (*Eudamus tityrus*, Fabr.), spoken of on page 27 of our last number in answer to T. W. G. of Georgetown, Ohio. The worm, which you call the "Mock-eyed worm," is the larva of the Troilus Swallow-tail (*Papilio troilus*, Linn.). It feeds on Sassafras and Prickly Ash.

W. D. Butter, Webster, Mo.—Your worm on Sassafras is the larva of the same Troilus Swallow-tail, spoken of above.

Insects Named—*Levi G. Saffer, Elizabeth, Ind.*—The large hairy wingless insect known in your locality as the "Stinging Ant," and which has only been known there for about ten years, is the same *Mutilla coccinea*, Linn., (♀) which was spoken of on page 32 of our last number in answer to Dr. M. M. Kenzie, of Centreville, Mo. The large "hornet" with pale rust-colored wings and black abdomen marked with pale yellow, and which you say is quite rare in your part of the country, is the Handsome Digger Wasp (*Stizus speciosus*, Drury), figured on page 129 of our First Volume.

Range of the Rear-Horse—*V. T. Chambers, Covington, Ky.* — The Rear-horse (*Mantis Carolina*, Linn.), is known to range as far North as Lat. 40°. We have no doubt but they would live in your part of the country.

Beetles named.—*Edw. P. Allis, Milwaukee, Wis.*—No. 1 *Aphodius fimetarius* Fabr. (Europe). No. 57 *A. granarius* (Europe). No. 2 *Onthophagus hecate*, Panzer ♂ ♀. No. 3 *Dineutes* near *americanus*, Fabr. No. 4 *Amara obesa*, Say. No. 31 *A. impuncticollis*, Say. No. 30 *A.* near *impuncticollis*. No. 5 *Acilius fraternus* ♀, Harris. No. 6 *Agonoderus pallipes*, Fabr. No. 7 *Harpalus faunus*, Say. Nos. 10 & 12 *Harp.* ———. No. 23 *H. erythropus*, Dej. No. 24 *H. pennsylvanicus*, Dej. No. 51 *H. herbivagus*, Say. No. 50 *H.* near *herbivagus*. No. 8 *Anisodactylus carbonarius*, Say. No. 22 *A. baltimorensis*, Say. No. 58 *A. rusticus*, Say. No 9 *Hister* ———. No. 13 *H. americanus*, Paykull. No. 38 *H. abbreviatus*, Fabr. No. 11 *Dytiscus hybridus*, Aubé. No. 14 *Platynus placidus*, Say. No. 15 *Pl. melanarius* Dej. No. 18 *Pl. cupripennis*, Say. No. 19 *Pl.* ———. No. 16 *Bembidium lucidum*, Lec. No. 17 *Merinus lævis*, Oliv. No. 20 *Chlænius pennsylvanicus*, Dej. No. 21 *Elaphrus ruscarius*, Say. No. 25 *Diplochila obtusa ?* Lec. No. 28 *D. impressicollis*, Dej. No. 29 *D. laticollis*, Lec. No. 26 *Pterostichus stygicus*, Say. No. 47 *Pt. mutus*, Say. No. 54 *Pt. desidiosus*, Lec. No. 27 *Pœcilus chalcites*, Say. No. 32 *Clerus nigripes*, Say. No. 33 *Trichius affinis*, G. & P. No. 34 *Mordella lineata ?* Melsh. No. 35 *Notiophilus semistriatus*, Say. No. 36 *Notoxus anchora*, Hentz. No. 37 *Cistela sericea*, Say. No. 40 *Gyrinus analis*, Say. No. 39 Dark variety of 40. No. 41 *Cicindela repanda*, Dej. No. 42 *C. 12-guttata*, Dej. Nos. 43 & 48 *C. splendida*, Hentz. No. 44 *Dacne heros*, Say. Nos. 45 & 53 *Tenebrio molitor*, L. (Europe). No. 46 *Parandra brunnea*, Fabr. No. 49 *Xylopinus anthracinus*, Knoch. No. 52 *Platycerus depressus*, Lec. No. 55 *Centronipus calcaratus*, Fabr. No. 56 *Diaperis hydni*, Fabr. No. 59. *Nyctobates pennsylvanicus*, Dej.——Several of the above arrived in very bad order. If you will send good specimens of Nos. 9, 10, 19, 30 & 50, we will try and determine them specifically. In a difficult genus, it is often impossible to determine the species with the requisite precision from one or two poor mutilated specimens.

The Royal Horned-caterpillar—*Dr. D. L. Phares, Woodville, Miss.*—In Vol. I, No. 12, (p. 230) we said that this insect "is quite scarce even as far south as Bushberg, Mo., Brighton, Ill., and St. Louis, Mo." We intended it to be inferred from this statement, that still further south it was by no means so scarce. You understand us to mean exactly the contrary, and inform us that it is not uncommonly met with in your neighborhood in latitude 31° 30′. As others may possibly make the same mistake, we think it best to say here in so many words, what it was that we really intended to be inferred from our language, namely, that this insect is much more abundant in southern than in northern latitudes within the limits of the United States.

Aquatic eggs—*W. O. Hiskey, Minneapolis, Minn.*—The round white semi-transparent eggs, about 0.03 inch in diameter, which you found attached to a stick of wood that had been under water, are most probably those of some air-breathing Water-snail, belonging to such genera as *Planorbis* etc. They bear a striking resemblance, except in size, to those of the large brown snail commonly met with in English gardens, which last in the days of our boyhood we used often to find in masses a little below the surface of the earth. We know of no aquatic insect that lays such eggs.

Insects named—*S. V. Summers, M. D., St. Louis, Mo.*—Your insects are as follows: No. 1, *Mantis Carolina*, Linn. ♀. No. 2, *Conorhinus sanguisuga*, Le Conte. (See Vol. 1, Fig. 74). No. 3, *Chlænius sericeus*, Say. No. 4, *Scarites subterraneus*, Fabr. No. 5, *Galerita janus*, Fabr. No. 6, *Patrobus longicornis*, Say. No. 7, *Pterostichus sculptus*, Lec. No. 8, *Chauliognathus pennsylvanicus*, De Geer. (See Vol. 1, Fig 55). No. 9, *Trox punctatus*, Germ. No. 10, *Oodes cupræus*, Chaudoir. No. 11, *Agonoderus pallipes*, Fabr. No. 12, *Bembidium nitidulum*, Dej. No. 13, *Platynus 8-punctatus*, Lec. No. 14, larva of No. 20. No. 15, *Diedrocephala mollipes*, Say. No. 16, *Arctia* [*Spilosoma*] *virginica*, Fabr. No. 17, *Hippodamia maculata*, DeGeer. (See Vol. I, Fig. 36.) No. 18, *Diabrotica vittata*, Fabr. (See Vol. II, Fig. 19). No. 19, *Diabrotica 12-punctata*, Fabr. (See Vol. I, Fig. 168.) No. 20, *Hippodamia convergens*, Guer. (See Vol. I, Fig. 39.) No. 21, larva of *Arma spinosa*, Dallas. No. 22, *Tachys pulchellus*, Ferté. No. 23, *Bembidium* near *4-maculatum*, Linn. No. 24, ♂ of No. 1. No. 25, *Haltica cucumeris*, Harr. (See Vol. I, Fig. 19). No. 26, *Tettigonia* [*Erythroneura*] *vitis*, Harr. We should like further specimens of No. 23.

Hair-worm or Hair-snake—*E. H. King, West Liberty, Iowa.*—The insect you send is the pupa of one of our green Meadow Catydids—perhaps *Orchelimum vulgare*, Harris, perhaps *Orch. glaberrimum*, Burmeister; but as in this genus there are a great many closely allied species, most of which are either entirely undescribed, or so briefly described that the same description will apply equally well to half a dozen distinct species, we should not like to speak positively as to the species to which your pupa belongs. "The long thread-like appendage" issuing from the upper surface of its abdomen, is a Hair-worm (*Gordius*), respecting which parasitic genus see the Answer to E. Baxter on page 57 of our First Volume. In a future article we shall illustrate this remarkable group of intestinal worms, which has long been known to infest different kinds of Catydids and Grasshoppers. The popular belief that these worms are animated horse-hairs is, of course, a simple delusion. Thanks to your careful packing, the specimen reached us in excellent order.

Dahlia Stalk Borer—*G. C. Broadhead, Pleasant Hill, Mo.*—The two worms which were found in Dahlia stalks, and which "seem to have entered when quite young and passed up, eating the pith out of the main stem," are the common Stalk Borer (*Gortyna nitela*, Guen.), which we have so often referred to and which we figured twice in our first volume (Figs. 11 and 140.)

Parsnip Worm—*Jno. Adams, Gray Corner, Maine.*—The worms found by you on Parsnip last July, were the larvæ of the common Asterias Swallow-tail (*Papilio Asterias*, Cram.)

ERRATA IN VOL. 2. NO. 1.

On page 27, column 2, line 13 from bottom, for "Gold Gilt-beetle" read "Gilt Gold-beetle." On page 31, column 1, line 30, for "*Culopteron*" read "*Calopteron.*" On page 31, column 1, line 41, for "No. 8 pin" read "No. 18 pin." On page 32, column 2, line 10, for "*Gasteracautha*" read "*Gasteracantha.*"

THE

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IN MEMORIAM.

It becomes our painful duty to record the death of Mr. WALSH, the Senior Editor of this Journal. The news of his demise caused many a breast to heave with unfeigned and heartfelt grief, not only in America, but in many portions of Europe; but on no one did the shock fall so suddenly and unexpectedly as on the writer.

On Friday, the 12th of November, he started in excellent spirits on his usual morning walk to the post office, and on his return, while walking toward Moline, on the track of the Chicago and Rock Island Railroad, he suddenly noticed the passenger train for Chicago slowly nearing him. Stepping aside, he continued his way on what he supposed was a side-track, which however proved to be the track down which the train in reality came, though he did not discover his mistake until the engine was close upon him. He now had no time to get off the track, and with great presence of mind, flung himself bodily as far away as possible, with the intention, as he afterwards related, of saving his body at the expense of his limbs. Unfortunately his left foot got caught and terribly mangled. The engineer succeeded in stopping the train before the drive-wheels of the locomotive had touched the foot, and Mr. WALSH was taken on board and carried back to the depot, whence he was conveyed to his home. Immediately after the accident, according to his own statement, he was so unconscious of pain, that he actually did not know that his foot was smashed until he attempted to raise himself. It was a matter of some surprise among his acquaintances, how so proverbially careful a man should allow himself to be thus overtaken; but in all probability his mind was entirely occupied and absorbed at the time, in the contents of a letter which he had opened and was reading. The engineer was ringing the bell and driving quite slowly, and it was so customary for persons to walk along the track, and step off in time, that he did not dream of stopping until it was too late. Mr. WALSH consequently took pains to publish an article exonerating him from all blame.

Doctors Galt and Truesdale were summoned to the house, and found it necessary to amputate the foot above the ankle. Mr. WALSH also insisted on this operation, which was immediately performed with great success. Mr. WALSH bore the amputation remarkably well and soon became quite cheerful, displaying his facetiousness by declaring in the most philosophical spirit, that nothing more fortunate could have happened to him. "Why," he would say to his grieving wife, "don't you see what an advantage a cork foot will be to me when I am hunting bugs in the woods: I can make an excellent pin-cushion of it, and if perchance I lose the cork from one of my bottles, I shall simply have to cut another one out of my foot."

On the day of the amputation, he sat up in his bed and penciled to us a letter which was written in such a sanguine and cheerful mood, that we felt no apprehension as to any fatal result from the accident. This letter was the last we ever received from poor WALSH, and though written under such trying circumstances, was yet characterized by much grit and humor. It commenced with: "I have been fool enough to get my left foot smashed," and after dwelling at length on matters pertaining to the illustrating of his next State Report, concluded with: "Adieu, Yours ever, the 99th part of a man!"

For a few days he did exceedingly well, and the amputated limb commenced to heal. During these days he was quite bright and cheerful, but suddenly he grew uneasy, and it became evident that he had sustained internal injury, probably in throwing himself so violently away from the engine. He lingered but a few days, and finally expired on Thanksgiving Day, the 18th of November. His mind was remarkably clear up to within a few hours of his death, and when the physicians informed him that his life was rapidly drawing to a close, he became perfectly calm and resigned to his fate; thanking his numerous friends over and over again for their kind attention, and declaring that he was ready to die—that he had lived beyond the average lot of mortal man, and that he ought to be, and was contented. Indeed, though not a church member, nor professing any religious faith, he met his fate with the calm dignity which befits one who has honestly labored to leave the world better for his having lived in it. During his last moments he dwelt wanderingly on entomological subjects, and finally expired so quietly that considerable time elapsed before those around him could feel assured that his spirit had really departed. On account of the severe storm which was sweeping over the Northwest at the time, and which precluded telegraphic communication, we were not permitted to be at his death bed, but those friends who were present declare that they never knew any one who bore a more perfect expression of life in death.

The funeral services took place on Sunday, the 20th, at the Baptist church in Rock Island, and the large congregation there assembled, and the unusual interest manifested, evidenced the very general respect in which Mr. WALSH was held, and the sincere regret that was felt at his loss. In the course of some appropriate and impressive remarks that were made on this occasion by Dr. Davis, he paid the following well merited compliment to the deceased:

Mr. WALSH was the friend of social progress and of law and order; believing that all men are born free and equal, and are all entitled to certain inalienable rights, among which are life, liberty and the pursuit of happiness. He was a strictly temperate man, himself abstaining totally from ardent spirits, and was decidedly opposed to their unrestrained sale or use. Clear and distinct in the formation of his sentiments, he was bold and fearless in declaring and in defending them. He has left behind him a name and a reputation that will long be remembered and respected. We shall no more behold his rapid walk along our streets, nor hear the well known tap of his staff upon our sidewalks. No longer will his vigorous motions among us bear testimony to the activity and energy of an intellect that tired not by age or was ever fatigued by constant employment. * * *

Mr. WALSH came to this country a stranger from Old England—England, which, with all her faults, and faults she has, we still should respect and love. Here his alien birth and education presented no obstacle to his progress. He asked for no peculiar privileges, he sought for no special favors. Entering the arena of life, he relied upon what he was and what an acquaintance with him would prove to others he possessed, for success and distinction.

He has not toiled in vain. Success and reputation attended him, and he has been and will be no less respected and distinguished because Old England instead of Young America, was his birth-place. * * * *

When the calamity that befel Mr. WALSH was known around, the people of this city and vicinity united in one general lamentation; and when the intelligence of his death was spread abroad, all felt that a great public loss had been sustained, a public calamity had befallen this city and land. And though he is to be borne to the grave with none but his beloved and respected wife to attend him as chief mourner—all, all our hearts are dressed in the habiliments of mourning. Better, far better than to be attended to the grave by a community in mourning, though but few relations and kindred unite in the solemnities, than to be followed to the tomb with hosts of kindred and relations, enshrouded in all the pomp and circumstance of mourning, and none but they, and hardly they, to feel any loss.

This city, this community, sympathize with the bereaved, the afflicted widow, and with one heart commend her to the support and grace of that compassionate God, who has said, "Leave thy widows with me."

And thus has this truly great man in his special department of science, been abruptly taken from our midst! Inscrutable, indeed, the ways of Providence must seem, when such a man is called away at the very time of his greatest glory—the moment of his greatest success! In the prime of his intellectual vigor, and not yet beyond the age from which much might have been expected, he would doubtless, had his life been spared, have accomplished more for the good of the world, would have achieved far greater fame, and would have attained a much more exalted position during the ten years to come, than he had done in the whole past course of his life. We are not stepping beyond the bounds of truth in asserting that Mr. WALSH was one of the ablest and most thorough Entomologists of our time; and when we consider his isolation from any of the large libraries of the country, and the many other disadvantages under which he labored, we are the more astonished at the work he accomplished. He was essentially original and *sui generis;* everything about him was Walshian, and though he had some of those eccentricities which frequently belong to true genius, and though he made many enemies by his bold, outspoken manner, and his hatred of all forms of charlatanism; yet those best acquainted with him know what a deep-feeling, tender and generous heart lay hidden beneath the rough and uncouth exterior. Mr. WALSH leaves no offspring, nor has he any relatives in this country; but fortunately his bereaved widow, who has our heartfelt sympathies in her distress, has connections near Rock Island.

BENJAMIN DANN WALSH was born in Frome, Worcestershire, England, on the 21st of September, 1808, and was therefore in his sixty-second year. He graduated at Trinity College, Cambridge, and his parents intended that he should enter the ministry; but he was not theologically disposed, and naturally had such a strong hatred of hypocrisy and of everything that had the semblance of wrong, that—judging from what he has told us—the inconsistent conduct of some of the collegiates who were studying for the ministry, in all probability prejudiced him against the church. At all events his tastes and inclinations were of an entirely different character from those which are necessary to make a minister of the gospel. We can learn but ltttle, even from his wife, of his career in England, but we know that he there published a bulky pamphlet on University reforms, almost all the suggestions in which he lived to see practically carried out. He also wrote for Blackwood and other English periodicals, besides newspaper articles without end, and in 1837 published a large octavo volume in London, entitled "Walsh's Comedies of Aristophanes." This volume is in many respects remarkable, embracing as it does the "Acharians," the "Knights" and the "Clouds," translated into corresponding English metres. There are many passages in this work illustrative of that same forcible style and utilitarian logic, which so characterized his Entomological writings.

This work was to have been completed in three volumes, but, owing to some difficulty with the publishers, we believe none but this one volume was ever issued.

Mr. WALSH married in England, and came to America in 1838. All his relatives are in England, and he has yet living five sisters and three brothers. Of the latter, THOMAS WM. WALSH, M. D., still resides at Worcester; J. H. WALSH ("Stonehenge") is the present editor of the London *Field*, and the well-known author of one of the best works on the horse in the English language; while the third brother, F. W. WALSH, is a clergyman and schoolmaster.

Upon arriving in this country, he went into Henry county, in Illinois, and purchased a farm of three hundred acres, near Cambridge, the county seat, where he determined to retire in great part from the world, and lead the life of a philosopher. He soon became thoroughly devoted to this country, and never once returned to England or expressed any desire to do so. He remained on the farm for upwards of thirteen years, leading a very secluded life, and associating but little with his neighbors, from the fact that there were few, if any of them, who were his equal in intellect, or could appreciate his learning. Yet he was thoroughly Democratic in his ideas, and had no false pride whatever: he did, as far as possible, all his own work, even to making his own shoes and mending his own harness. Finally, a colony of Swedes settled in his neighborhood, and, by damming up the water at Bishop Hill, produced so much miasma in the vicinity, that very much sickness prevailed there. His own health in time became impaired, and at the suggestion of M. B. Osborn, of Rock Island, he removed to that city in 1851, and entered into the lumber business. He carried on this business about seven years, during which he found time to publish much fugitive matter in newspapers, principally on political topics, always affixing his signature, and scorning even the appearance of deceit.

In politics he was a Radical Republican, hating all forms of slavery and oppression. As late as Grant's campaign he was a member of the Tanner's club of Rock Island; and we shall never forget the enjoyable hours we spent with him at some of the meetings of the club, where one forgot his real age in contemplating his unusual good spirits, activity and vigor. In 1858 he suspected that the City Council was cheating the city, and though no politician, he ran for Alderman for the express purpose of getting at the books, and of thus being enabled to investigate the matter and publish the facts. Such a course naturally made him many enemies, and he was waylaid and his life threatened; but he succeeded in getting elected, and after exposing the frauds, and thus accomplishing his purpose, he resigned. In the same year he retired from the lumber business with something of a competency, and built a row of buildings on Orleans and Exchange streets, known as "Walsh's Row."

Up to this time, though he had formerly made a small collection of insects in England, he had paid no attention to Entomology in this country. But as soon as the buildings were erected, he devoted himself entirely to this, his favorite science. Thus his Entomological career dates back scarcely a dozen years, but how faithfully and perseveringly he labored, the record of those years abundantly testifies. The first published account that we can find of Mr. WALSH as an Entomologist is in the report of a lecture which he delivered before the Illinois State Horticultural Society at the Bloomington Convention, in January, 1860. He there spoke extempore for two hours, displaying that rare faculty which he possessed of communicating his ideas in such a manner as to please and hold the popular ear. The reporter of this lecture, whom we take to be Mr. C. D. Bragdon, at the present time one of the editors of *Moore's Rural New Yorker*, states that he became so intensely interested, that his hand refused to move his pencil. After this time he became a regular contributor to the *Prairie Farmer*, of Chicago, Ills., and also wrote for a few other agricultural journals, such as the *Illinois Farmer* of Springfield, Ills., the *Valley Farmer* of St. Louis, Mo., etc., etc., his aim throughout being to rouse the agriculturists to a sense of the immense losses they sustain from the depredations of injurious insects, and to impress upon them the necessity of a more general knowledge of the habits of these little foes. From 1862 to 1866 we find about a dozen scientific papers from his prolific pen, scattered through the Proceedings of the Boston Society of Natural History, and through those of the Philadelphia Entomological Society. These papers are all characterized by great freshness, originality and accuracy, and they will forever redound to his honor, and in our minds will be more and more appreciated as the true workings of Nature are better understood. Mr. WALSH was a school-mate with Darwin, and though he took up the latter's work on the Origin of Species with great prejudices against the development hypothesis, yet he became a thorough convert to Darwinism after he had once studied it. Throughout these papers he consequently brings forward a great number of facts in support of this theory, and his remarks on Phytophagic Varieties and Phytophagic Species bear directly on this subject and have done much to help us to a clear understanding of the term species.

In October, 1865, the Entomological Society of Philadelphia commenced the publication of a monthly bulletin entitled the *Practical Entomologist*. This little journal was edited by the publication committee of the Society, consisting of E. T. Cresson, Aug. R. Grote and J. W. McAllister. Very soon, however, Mr. WALSH was added to the list, as Associate Editor from the West, and he finally became sole Editor of the second volume, the publication being discontinued in September, 1867. So well had he succeeded in opening the eyes of the people of his own State to the vast importance of Economic Entomology that the State Horticultural Society at last petitioned the Legislature to appoint a State Entomologist, and accordingly at the biennial session of 1866–7 a bill was passed authorizing the appointment of such an officer with a salary of $2,000 per annum, the appointment being vested in the Governor, by and with the consent of the Senate. At the special session held in June, 1867, the Governor sent in, on the 11th of that month, the name of Mr. WALSH for confirmation, but the Senate postponed all action upon it till the next regular biennial session in the winter of 1868–9. Mr. WALSH, however, at the earnest solicitation of many of the leading Agriculturists and Horticulturists of the State, went on and discharged the duties of the office, and trusted to the future liberality of the Legislature to reimburse him for his work. As Acting State Entomologist he issued his First Annual Report for 1867, which was published as an appendix to the State Horticultural Transactions for that year.

In September, 1868, in conjunction with the writer, he started the AMERICAN ENTOMOLOGIST. We shall so miss his ripe experience, and his help, that the task of continuing this journal will be trebly hard. Indeed, so well satisfied are we that his place can never be entirely filled, that did we consult our own pleasure we should not undertake the task alone, for we have other pressing duties. But in memory of our departed friend, and in justice to our numerous readers, we shall continue our labors, and though the ENTOMOLOGIST may never be edited so ably, yet with the assistance and sympathy of its patrons, we may hope to make it as useful in the future as it has been in the past.

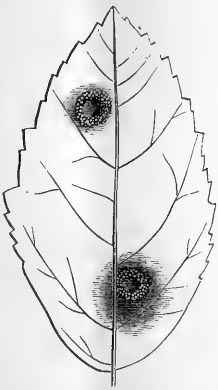
We had hoped to accompany this number with a steel plate of Mr. WALSH, but could not very well wait till it was finished. We shall present it in our next number, accompanied with several resolutions that have been passed by different societies. Mr. WALSH was rather sparing of his own portraits, and we know of but one good one in existence: this liberality on our part, will therefore be appreciated by our readers, and especially by those who were most intimate with the deceased.

☞ For the benefit of our new subscribers who did not receive the August number, we will state, that the second volume of the AMERICAN ENTOMOLOGIST is to end with the year 1870. This fact will explain the apparent inconsistency of making one number cover two months.

APPLE-LEAF "CLUSTER-CUPS."

There is a peculiar kind of orange-colored fungus, which we have noticed for a long time to be exceedingly abundant in particular seasons on the leaves of the wild crab (*Pyrus coronaria*). On the upper surface of the leaf it appears early in the season as a large orange-colored blotch; and somewhat later in the year, if the under surface of the leaf is examined, it presents the appearance of Figure 43.* If we apply a moderately powerful lens to the little circle of dots exhibited in this drawing, we shall see that each dot, when sufficiently magnified, is a little miracle of vegetable structure, and looks very much like one of those Sea Anemones (*Actinia*), with which the popular eye has now become sufficiently familiarized through such elegant little works as the *Seaside Studies*.† In Figure 44 we give a view of one of these magnified dots, several scores of which go to compose the complete circle shown in Figure 43

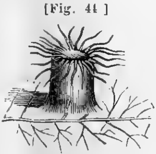
[Fig. 43.]



Colors—Orange, the ring blackish.

It will thus be seen that each dot forms a regular cylinder of great beauty, with an aperture at its summit fringed with long transparent hairs, which are very sensitive to moisture and curl up when wetted so as to close the aperture. Inside the cylinder, under a good microscope, we may discover a mass of minute brownish grains, which are technically termed "spores," and though they are much simpler in their structure than the true seeds of Flowering Plants, they yet perform precisely the same function in nature, that is, the reproduction of the species. This particular group of parasitic funguses are known in English as "Cluster-cups," and the particular species that we now have to deal with may be called the "Apple-leaf Cluster-cup" (*Œcidium pyratum*, Schweinitz).

[Fig. 44.]



Color—Orange, varied with brown-black.

As we have already said, the native home of our Apple-leaf Cluster-cup is on the indigenous crab of North America; but like many such parasitic growths it has acquired the habit of attacking one or more imported plants, which are closely allied to the species which in the first instance it must have exclusively infested. Four or five years ago we received from J. Wood, of Marietta, Ohio, specimens that had been found on the leaves of the common Apple-tree; and the *American Agriculturist* lately received such from T. W. Sparkman, of Clifton, Tenn., with the following statement: "This disease has prevailed among some trees in this vicinity several years; it gradually gets worse, and the trees fail until they at length die. One of the worst trees is a wild Crab Apple. There are a great many limbs attacked and some of the apples." Lastly, we have been informed by Mr. McLane, of Charleston, Central Illinois, that in 1869 his Fall Rambos were so full of these Cluster-cups, that more than one-half the leaves were infested by them; and that in consequence, although the fruit was partially perfected, it dropped off prematurely in a more or less defective condition.

From the recorded history of Noxious Funguses and Noxious Insects, we may consider it as by no means an improbable event, now that this indigenous fungus has acquired the habit of attacking an imported plant, that it will transmit that habit, by the Laws of Inheritance, to its descendants, and thus eventually, by the multiplication of individuals possessing the newly-acquired taste, become a great pest to the Fruit-grower. It is well, therefore, to put our readers on their guard against this little pest; for although, strictly speaking, such matters belong to the Botanist rather than to the Entomologist, yet by a kind of tacit consent the study of our Funguses has been bandied about "from pillar to post" among the different Specialists in Natural History, till like Noah's dove it can scarcely find any resting place for the sole of its foot.

As to remedies against this Parasitic Disease: Whenever an entire apple-tree has become badly infested, it would be advisable to cut it down and burn it, before the infection becomes widely disseminated. If only a few leaves or a few boughs are attacked, they should for the same reason be gathered by hand and burnt; but in doing this, care must be taken to perform the operation before the little cups, from which these "Cluster-cups" take their

*We reproduce this, as well as the following figure, from an excellent Article on this subject in the *American Agriculturist* for December, 1868, to which we are also indebted for several of the details given herewith.

†See *Seaside Studies in Natural History*, by Mrs. E. C. Agassiz and A. Agassiz, page 8, figures 3, 4 and 5.

name, have perfected their spores so as to disseminate the evil. We have made no notes of the precise time of the year at which the Apple-leaf Cluster-cups attain maturity; but, so far as we recollect, it is some time in the month of July. The best practical rule will be to destroy them as soon as ever the rings begin to develop on the lower surface of the leaf; and if there are any infected Crab-trees growing in the vicinity of the Orchard, they should be cut up root and branch without the least compunction, and unceremoniously subjected to the purgation by fire.

GALLS AND THEIR ARCHITECTS—2d ARTICLE.

[CONTINUED FROM PAGE FIFTY.]

[In our last number we commenced a second article on "Galls and their Architects," describing some of the galls made by Saw-flies. It was our intention to continue this article through several numbers, so as to embrace certain galls made respectively by Gall-flies, Beetles, Moths, Psyllas or jumping Plant-lice, Gall-gnats and Mites, and thus give our readers an idea of all the different groups of gall-making insects. Mr. Walsh had already written the article which appears below, and at the time of his fatal accident was working at, and had nearly completed, another on "Galls made by Beetles," which will appear in our next. We shall endeavor, to the best of our ability, to complete the series, as nearly as possible in the same manner intended by Mr. Walsh.]

Galls made by Gall-flies.

[Order *Hymenoptera*, *Cynips* Family.)

In our former Article, we described and illustrated three different galls made by insects belonging to a genus (*Cynips*) which peculiarly infests the different kinds of Oak. We propose in this chapter to give the history of two other oak-galls produced by this genus of Gall-flies. There is a distinct genus (*Rhodites*) belonging to this same Family, which exclusively attacks the Rose; and another (*Diastrophus*) which confines itself almost entirely to the Bramble; besides a fourth (*Tribalia*) which originates a very curious many-celled gall on the tubers of the common Potato. Indeed, with the exception of the Gallgnats (*Cecidomyia*), which are quite cosmopolitan in their tastes, almost every genus of gall-making insects peculiarly affects some particular genus of plants; or—to express the same fact in different language—every group of gall-makers found upon a particular group of plants has certain structural peculiarities which distinguish it from allied groups found on other groups of plants. In illustration of this general law, we shall towards the close of this chapter describe and illustrate a new and perfectly distinct genus of Gall-flies, a single species of which we have discovered to generate a "monothalamous" or one-celled gall on a plant (*Lygodesmia juncea*) peculiar to the Northwest.

Upon the old-fashioned theory of every species, whether of animals or of plants, having been created at the beginning of some geological epoch, with exactly the same organization and coloration and habits that it retains to the last day of its existence upon this earth, it seems difficult to account for such a state of things as the above. For example, there are already about 60 described N. A. species of the genus of Gall-flies (*Cynips*) that affects our different Oaks. Every one of these forms galls upon some kind or other of Oak, while not one solitary species attacks any other plant. Similarly in Europe there are about 100 species belonging to this genus, every one of which with perhaps a single exception is exclusively confined to the Oak. Why should this be so? Why should not at least a few of these 160 gall-makers be found upon other plants besides the Oak? The old school of philosophers can only reply, that it is so because Nature has seen fit that it should be so. To parody the language of Shakspeare,

> They have no reason but a woman's reason;
> They think that it is so, because it *is* so.

On the other hand the new school of philosophers will reply that it is so, because myriads of ages ago a single primordial Gall-fly took to forming galls upon some species or other of antediluvian Oak; and that from this one species have gradually and slowly originated by hereditary descent, through the instrumentality of continual slight changes in their organization and consequently in their habits, the 160 distinct kinds of Gall-flies that at the present day form distinct galls upon the many distinct kinds of Oak that exist on either side of the Atlantic. Upon this hypothesis we can see at once why these 160 Gall-flies all inhabit the Oak, and are not distributed with some approximation to uniformity among our Beeches, Birches, Poplars, Willows, Ashes, Elms, Hickories, Walnuts, Hackberries, Hazels, Witch-hazels, Sumacs, Dogwoods, Pines, Grape-vines, False Indigos, Roses, Brambles, Thorns, Plums, Cherries, Basswoods, Maples, and Box-elders—all of which twenty-four genera of woody plants are to our personal knowledge infested by some kind or other of gall-makers, and cannot therefore be physically incapable of bearing galls. The reason is simple. Their ancestors inhabited some kind or other of Oak in some old Palæozoic epoch millions of years ago, and by the Laws of Inheritance transmitted the same habit to most of their descendants. Upon the same principle the progeny of the ancient black race of men that inhabited Ethiopia in the days of the Pharaohs, is found in that very same region up to the present day.

Which of the above two explanations of a most curious and interesting phenomenon be the more rational or intelligible, our readers must judge for themselves.

The Wool-sower Gall.

(*Quercus seminator*, Harris.)

The three Willow galls produced by Saw-flies, that we have already treated of in this Article, are all "monothalamous." The two Oak-galls that we are now about to describe are both of them "polythalamous" or many-celled; that is, each gall contains an indefinite number of distinct cells, each of which is inhabited by a single gall-making larva. In the Wool-sower gall (Fig. 45 *a*, sectional view), these cells

[Fig. 45.]

Color—Light buff.

may be seen in the middle of the gall, and are little pip-like bodies having much the appearance of a canary-seed, one of which we represent enlarged at *b*, so as to show the hole through which the perfect fly has made its exit. The reader can form a tolerably good idea of the shape and make of this fly, by referring to the drawing given in our first Volume (page 104, fig. 81) of an allied gall-fly, which however is thrice as large and which differs further from the Wool-sower Gall-fly by the wings being much marked with brown-black.

The Wool-sower gall is met with exclusively on the White Oak, and like the Oak-fig Gall to which we formerly referred (Vol. I. p. 101) is, not a bud-gall, but a true twig-gall, growing early in the spring out of the bark of the twig itself. Mr. Bassett (*Proc. Ent. Soc. Phil.*, II, p. 331) broaches the theory that the Wool-sower gall and Osten Sacken's *Q. operator* gall are not twig-galls, but true bud-galls, and that "their cells are modified leaves, the silky fibres covering them being only a monstrous development of the pubescence always observable on young leaves." But 1st: As to the Oak-fig gall, we have already recorded the fact that "this mass of subglobular galls about the size of peas is clustered densely around the infested twig, *without in any wise interfering with the normal development of the buds.*" (*Ibid.* VI. p. 275.) We may remark by the way that we have recently found the Oak-fig gall upon undoubted Bur Oak (*Q. macrocarpa*), although it had been previously supposed that it never occurred except on White Oak (*Q. alba*). 2d: As to the *Q. operator* gall, we ascertained long ago that it is a deformation, not of the twig, nor of the leaf-buds, but of the male flower of the species of Oak, upon which alone we have hitherto met with it, namely the Black Oak (*Q. tinctoria*); for the Black-jack Oak (*Q. nigra*), upon which Osten Sacken first discovered it, does not grow in North Illinois. Even on this last oak Osten Sacken records the fact that his gall occurred exclusively "on young flowering branches." (*Ibid.* I. p. 256). 3d: As to our Wool-sower gall, if the cells were a deformation of the buds, we should surely find them gathered into two distinct groups around the bud on each side of the oak-twig that gave origin to them, as in the gall which is next to be noticed; whereas they are always evenly distributed around the axis of the twig. Besides the pip-like cells to which we have already referred, it is composed of little else but a mass of whitish, spongy wooly matter, the external surface of which is of a pretty rose-color early in the season, but towards the middle of the summer assumes a rusty brown shade. At every period of the year the outside of the gall is invariably studded with numerous conical projections or teeth, which are very characteristic, though our engraving scarcely shows them as pointed as they are in nature, and Dr. Fitch's figure omits them entirely. The perfect Gall-fly comes forth about the end of July, and the female must then, after coupling with the males, puncture such White-oak twigs as she judges to be suitable for her purpose in a very great number of adjoining points, dropping an egg along with a minute drop of poison into each puncture. Until the following spring these eggs always lie dormant, as in many other such cases; for Dr. Fitch is altogether wrong in asserting that there are two distinct broods of Wool-sower Gall-flies every year, generating two distinct sets of galls.* We have examined hundreds of these galls at all seasons of the year; and never yet did we find one at a later period than the end of July, that was not bored up, empty and untenanted. In fact, it is not often that they remain on the twigs through the winter; for when ripe they are attached so very slightly to the twig upon which they grow, that they can readily be slipped up and down like the beads of a rosary, and the least lateral jerk displaces them entirely.

The Leafy Oak-gall.

(*Quercus frondosa?* Bassett.)†

This gall, the immature stage of which we herewith present a drawing (Fig. 46 *a*), has

[Fig. 46.]

Color—Green.

for many years been a puzzle to us; and even now its history is not yet completely developed, though we have examined hundreds of specimens of it. When mature it often attains a diameter of two and a quarter inches, and the modified leaves of which it is composed are then much longer and proportionally much wider than they are at first, so that instead of being what the botanists term "lanceolate" they become "oval," with their tips usually acute, and occasionally with a more or less well-developed acute tooth projecting from one side of the leaf. Just as, in the case of the Pine-cone Willow-gall,* although the leaves of the willow upon which it grows are always sharply toothed upon their edges, those of the gall itself are never toothed at all, so in the case of this Leafy Oak-gall the leaves of which it is composed are never roundly many-lobed, as are those of the different oaks upon which it occurs. They are further anomalous by very generally lacking the rib vein found in the normal leaves of all oaks. So singular very frequently is the influence of the gall-making insect upon the vegetation of the plant which it attacks!

In a mature Leafy Oak-gall which we now have before us, some of the leaves of which it is composed are nearly one and a half inch long by half an inch wide; and those that are smaller are proportioned nearly in the same way. The gall is developed after the summer growth of the tree is completed; and the axillary bud, which otherwise would not burst until the spring following, is forced, by the punctures of the Gall-fly, to develop prematurely in the remarkable manner illustrated above. Such galls as are of small size contain but a single cell (Fig. 46 *b*), which though its shell is thin is tolerably hard and difficult to crush—but the larger ones often cover three, four or five such cells; inside this cell reposes the larva, as shown in the figure, and the characters of the larva indicate it unmistakably to be that of some Gall-fly or other, although it has not as yet been reared by any one to the perfect fly state. By parting the leaves of the gall, the tip of the greenish white cell may be seen imbedded among them; and singular to relate, about the middle of the autumn, when the gall becomes mature, the cells are gradually disengaged from their leafy matrix and drop to the ground, where no doubt the larva will pass the winter more agreeably among the masses of dead leaves which accumulate in such situations, than it would do if it were exposed aloft to the stormy blasts and the cold driving sleets of the dead season of the year. In all probability the future Gall-fly bursts forth from its snug retreat some time in the fol-

* *New York Reports*, Vol. II, § 315.

† We are not quite sure that our gall is identical with the one described by Mr. Bassett under the above name; but we incline to believe that it is. The descriptions of gall-making insects that this author has published are generally pretty full, accurate and reliable; but most of the notices that he gives of the galls themselves are curt, indefinite and unsatisfactory to a most distressing extent. In this particular case he does not vouchsafe to tell us upon how many specimens—whether one or one hundred—his description is based; he does not say one word as to the size of the gall; he overlooks the fact of its often containing more than one cell; he omits the fact of the matured cells dropping to the ground; and he describes his gall as "a cone-like body, covered when green, and often when dry, with a dense rose-like cluster of imperfectly developed leaves;" after which he goes on to speak of the cell. Any one not familiar with this gentleman's style would suppose that he was talking of a solid conical gall, like the Pine-cone Willow-gall (Vol. I, Fig. 82), with a number of leaves growing out of it. The best that we can do, under the circumstances, is to GUESS that he is saying one thing and meaning another thing. But as we are not Yankees, like Mr. Bassett, who can be certain that we are GUESSING RIGHT?

* See AMER. ENT. I, p. 105, Fig. 82.

lowing spring or summer; but on this matter we can at present only judge from analogy. We may add that we are acquainted with an undescribed Hackberry-gall, formed by a gall-gnat, where the cells drop to the ground when mature precisely as in this gall which is formed by a Gall-fly.

So rapid is the development of the Leafy Oak-gall, from the time when it first begins to appear to the time when the cells that contain the larva drop to the ground, that up to 1869 we had never seen anything but the empty gall. We have ourselves met with it in Northern Illinois both on Bur Oak and on White Oak; and Mr. Bassett of Waterbury, Conn., found it upon the Chinquapin Oak (*Q. prinoides*). We have also received specimens from Mr. McAfee of Freeport in North Illinois, and others from B. H. Brodnox of Pickens' Station, Miss.; so that it would seem to be pretty generally distributed throughout the Union. Oak-bushes that have been badly infested by this gall present a singular appearance in the following winter and spring; the empty galls turning black, losing the tips of many of their leaves, and looking then more like an army of great hairy black caterpillars, curled up in repose all over the naked twigs, than anything else to which we can compare them. In 1866, from ignorance of the true history of this gall, speaking of it as the Oak-cabbage gall (*Q. brassica*, Walsh MS.), we erroneously assumed it to be the work of some unknown Gall-gnat, many species of which group of insects originate galls on different kinds of oak.* At that period we had bred from it nine specimens of a Guest-sawfly (*Nematus quercicola*, Walsh), which like certain other guest-flies is remarkable for being to all external appearance absolutely undistinguishable from a true gall-making insect (*Nematus s. pisum*, Walsh), that produces a leaf-gall on a species of Willow. And yet, though externally undistinguishable, these two Saw-flies differ notably in their habits, the Gall-maker always leaving its gall and going underground to pass into the pupa state, and the Guest-fly remaining in the Leafy Oak-gall all through the winter, and not coming out in the fly state till May or June of the following year. So little dependence can we place upon the decisions of mere closet-naturalists, relative to the identity or distinctness of species! For in this, as in several other such cases enumerated by us, it is impossible for any one to tell the difference between the Gall-maker and the Guest-fly; and yet it would be as absurd to suppose that the two form but one species, and that one and the same species is sometimes the architect of its own gall and sometimes spunges upon true gall-making insects for a nidus for its future offspring, as it would be to imagine that the European Cuckoo, or our North American Cowbird, sometimes builds a nest for itself and sometimes surreptitiously deposits its eggs in the nests of other birds.

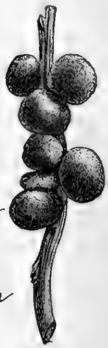
*See a Paper on Willow Galls in *Proc. Ent. Soc. Phil.* VI. p. 260.

The Lygodesmia Pea-gall.

(*Lygodesmiæ pisum*, new species.)

There is a rush-like plant about a foot high, with slender sprangling stems and a few rigid lance-shaped leaves, which inhabits Nebraska and the regions to the east and north of that territory, and is known to botanists as *Lygodesmia juncea*. On the stems of this plant there often grows a profusion of round or oval pea-like galls, ranging in diameter from ¼ to ½ an inch, such as are represented in the annexed Figure 47. In the autumn each of these galls contains, in a central cavity about one-tenth of an inch in diameter, a fat yellow legless maggot, with a large round head and robust jaws tipped with black. Except the central cell, the rest of the gall consists of a dense whitish spongy matter, which ultimately becomes so hard as to be penetrated with some difficulty by the thumb-nail. About the middle of the following May there eats its way out of the gall, through a small pin-hole (Fig. 47, *a*), a black Gall-fly about one-eighth of an inch long, which scarcely differs in general appearance from the Oak-plum Gall-fly (Vol. I. p. 104, Fig. 81) except in being so much smaller and in lacking the dark shade on the front wings. This Gall-fly is entirely new to science, and, as we have already explained, it is especially interesting because—growing as it does on a group of plants not hitherto known to be infested by Gall-flies—it presents structural characters different from those found in any other Gall-fly. In other words, a new genus has to be established to receive it, besides giving the characters separating it from any other species belonging to the same genus, which may hereafter be discovered. But as such details as these are only of interest to the scientific reader, we shall throw them

[Fig. 47.]



Color—Opaque ash-gray.

into the form of an Appendix—to be "skipped" at discretion by the general reader.

APPENDIX TO THIS CHAPTER.

Osten Sacken has repeatedly complained—and with very great justice too—of the exceedingly slovenly manner in which certain European authors have attempted to define and limit the multiplicity of new Cynipidous genera which they have thought fit to establish.* (*Proc. Ent. Soc. Phil.*, IV. p. 338, etc.). In our paper on *Cynips* (*Ibid.*, II. pp. 468–9 and 477–8) will be found, first, the characters which in our opinion separate *Cynipidæ* from *Figitidæ*, and secondly those which separate the Gall-making Gall-flies (*Cynipidæ psenides*) from the Guest Gall-flies (*Cynipidæ inquilinæ*). We will now give a Synoptical Table of those genera of *Cynipidæ psenides* found in N. A., which we consider to be sufficiently distinct to be classified as anything more than subgenera. In such matters as these, opinions of course will differ; but we have always thought that a good reliable Synoptical Table of genera is worth far more to the scientific student than one hundred times the same space occupied with mere generic circumscriptions, full of tautology and indefinite platitudes.

N. A. GENERA OF CYNIPIDÆ PSENIDES.

A. The second abdominal joint (counting the peduncle as the first) very large; the rest quite small and sub-equal.
  1. Ventral valve female moderate..........**Cynips**, on Oak.
  2. Ventral valve female enormously elongate, horny and shining.............. **Rhodites**, on Rose.

B. The 2d abdominal joint moderate; the rest smaller and sub-equal. (Ventral valve female nearly as in *Rhodites*).......... **Tribalia**, on Potato.

C. The 2d and 3d abdominal joints large, the 3d rather smaller than the second; the rest much smaller and sub-equal.
  1. 3d joint of antennæ longer than 4th......**Diastrophus**, on *Rosaceæ*.
  2. 3d joint of antennæ shorter than 4th....**Antistrophus** n. g., on *Compositæ*.

D. Abdominal joints 2—7 sub-equal...............**Ibalia**, habits unknown.

ANTISTROPHUS, n. g.

Infests *Lygodesmia* (Family *Compositæ*) and differs as follows from *Diastrophus*, a genus infesting Bramble (*Rubus*) and occasionally the allied *Potentilla* (Family *Rosaceæ*):—1st. The 3d joint of the antennæ is much shorter than the 4th, whereas not only in *Diastrophus*, but in all other *Cynipidæ* known to us, joint 3 is longer, and often very much longer than joint 4. 2d. Both transverse veins in the front wing are fully as slender as the other veins, almost entirely colorless as well as the other veins, and not margined by any cloud whatever. 3d. The radial area is more elongate, but otherwise similarly shaped; and as in *Diastrophus cuscutæformis* O. S. (but not in *D. nebulosus* O. S.) the areolet is obsolete.

Antistrophus l. pisum, n. sp. ♀ Black. *Head* opaque, confluently and almost microscopically punctate, the face with very fine and short appressed pubescence; color, a dark rufo-sanguineous, very rarely on the occiput verging upon black. Antennæ 4–5ths as long as the body, 13-jointed, joint 4 longer by ½ than joint 3, joints 5—12 very slowly shorter and shorter, joint 13 as long as 11 and 12 put together; the two basal joints almost always black, the rest of a dark rufo-sanguineous color. *Thorax* opaque, confluently and almost microscopically punctate; the parapsidal grooves distinct and acute, the dorsal one obsolete on its anterior ⅙, and with an abbreviated longitudinal groove on each side of it, extending from the collare half way to the scutel. Scutel large and inflated, directed upwards and backwards, its tip widely rounded and with a slight medial emargination; the normal basal foveæ shallow and almost confluent, and covering about ½ of its upper surface. Collare very often, and sometimes the pleura and mesonotum, and occasionally the tip of the scutel, more or less rufo-sanguineous. *Abdomen* shining and polished; "ventral valve" rectangular at tip, with only a very minute apical thorn, thin and semitransparent and of a pale rufous color. "Dorsal valve" distinct, but never showing the ovipositor projecting from its tip. *Legs* bright rufo-sanguineous. *Wings* hyaline; veins and cross-veins scarcely tinged with brown; the radial area fully thrice as long as wide, with the 2nd transverse vein attached to it scarcely 1-6th of the way to its tip. Cubitus obsolete at its origin from the 1st transverse vein. All the longitudinal veins nearly, but not quite, attaining the margin of the wing.—Length ♀ 0.12—0.14 inch.

The ♂ differs from ♀ only as follows:—1st. The head is scarcely ever, and the thorax never, tinged with rufo-sanguineous. 2nd. The antennæ are fully as long as the body, 14-jointed, joints 1—4 as in ♀, joints 5—13 very slowly shorter and shorter, joint 14 a trifle longer than 13. 3rd. The legs are of a darker and duller color, and the hind tibiæ are obscurely tinged with dusky towards their tips.—Length ♂ 1.10—0.11 inch.

Described from 29 ♂, 34 ♀, which came out May 12th—26th, 1869, from galls kindly sent us in the preceding March by E. P. Austin of Omaha, Nebr. We had previously bred a few specimens ♂ ♀ of the same insect in the spring of 1868 from galls gathered by ourselves on the Plains of the West from the very same plant. According to Dr. Asa Gray (*Manual*, 4th edition, page xcv.) this plant also grows in Wisconsin, where no doubt the same galls may be met with upon its stems.

* Giraud, as stated by Osten Sacken, reared what he has described as a *Diastrophus* from a gall growing on the Compositous plant *Centaurea scabiosa*. (*Verh. Zool. Bot. Gesellsch. Wien.*, 1859, p. 368.) We strongly suspect that this gall-fly belongs in reality to our new genus *Antistrophus*. The genus *Phanacis* of Foerster, of which a single species, *Ph. centaureæ*, has been "reared from the stalks of *Centaurea scabiosa*" by that author, as quoted by Osten Sacken, is apparently a guest-fly, and is probably inquilinous on Giraud's so-called *Diastrophus*, which was described three years after Foerster published. (See *Verh. d-Rheinl. Vereins fur Naturk.*, XVII, p. 145, 1856.)

CABBAGE BUTTERFLIES.

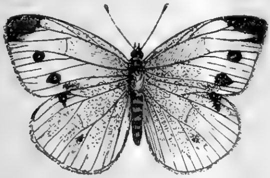
BY CHAS. S. MINOT, BOSTON, MASS.

There is a certain group of butterflies known, scientifically, by the name of *Pieris*, to farmers as "Garden Whites" or "Cabbage butterflies." They are easily recognized by the following characters: The wings are generally white, with inconspicuous black markings, and occasionally with green or yellow underneath; they are very broad and have no scallops or indentations in the margin; the hindwings in outline resemble an egg. "The feelers (palpi) are rather slender, but project beyond the head; the antennæ have a short flattened knob. Their flight is lazy and lumbering. The caterpillars are nearly cylindrical, taper a little towards each end, and are sparingly clothed with short down, which requires a microscope to be distinctly seen. They suspend themselves by the tail and a transverse loop, and their chrysalids are angular at the side and pointed at both ends." (Harris).

This genus is interesting, though disagreeably so, to every farmer, for the different species are very destructive to various vegetables: among others cabbages, nasturtium, mignionette, cauliflowers, turnips, and carrots. We propose now to notice only two of the species, as that number will serve to indicate the habits of the whole genus—which every farmer should be familiar with, so that he may be able to recognize and destroy such dangerous foes.

The first species we shall mention is the Rape Butterfly (*Pieris rapæ*, Schrank, Fig. 48). This insect has been the occasion of some little speculation and great interest to our New England and Canadian entomologists, inasmuch as

[Fig. 48.]

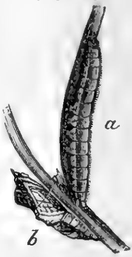


Colors—Black and white.

it has been introduced to this country from England, and is probably one of the most perfect instances on record of any insect being imported from one country to another and becoming completely naturalized in its new quarters. There does not seem to be the slightest doubt that this is the English species. It was probably introduced in 1856 or '57. It was first taken in Quebec in 1859, and in 1863 it was captured in large numbers by Mr. Bowles in the vicinity of that city. As the eggs are laid on the undersides of leaves, it was probably introduced in this form, the refuse leaves being thrown out of some ship; after which the larvæ hatched, and finding themselves in the neighborhood of their food, ate and flourished. Being, moreover, hardy little fellows, they were perfectly able to endure a change of climate. In 1864 it had spread about forty miles from Quebec as a centre; in 1866 it was taken in the northern parts of New Hampshire and Vermont; in 1868 it had advanced still farther south, and was seen near Lake Winnepesaugee; and finally this last summer it was taken around Boston, Mass., and a few stray specimens in New Jersey. There seems to be no doubt that this destructive insect will, in a few years, spread over the whole of temperate North America; for the other species of the genus have an extensive geographical range, and not being particular as to its food, it will have no difficulty on that score. Indeed, the larva and pupa seem to have an unusual power of accommodating themselves to circumstances,—for instance, Mr. Curtis, in his *Farm Insects* of England, states that the caterpillars have been found feeding on willow.

Now let us look at the larva (Fig. 49 *a*), and its habits. It is one and one-half inches long; pale green, finely dotted with black; a yellow stripe down the back, and a row of yellow spots along each side in a line with the breathing holes. In England and around Quebec it has done immense damage to the cabbages and other Cruciferæ (*Cress* Family) by boring into the very heart of the plant, instead of being content with the less valuable outer portion, as some other species are. On this account the French call it the "Ver du Cœur," or Heart-worm. When about to transform, it leaves the plants on which it has been living, and fastens itself on the underside of some stone, plank, or fence-rail, where it changes into a chrysalis in the middle or latter part of September, and in this stage it hybernates, producing, in New England at least, the perfect insect early in April. The chrysalis or pupa (Fig. 49 *b*), is variable in color, being sometimes yellowish-brown or yellow, and passing thence into green, speckled with minute black dots. The brood of butterflies that emerges from the pupa state in the spring lays eggs shortly afterwards, and these eggs produce caterpillars, which in their turn change to chrysalids in June, and in seven or eight days more the butterfly appears, which again lays its eggs for the second brood, which, as before stated, hybernates in the pupa state.

[Fig. 49.]



Colors—(*a*) pale green; (*b*) yellowish-brown.

In the perfect butterfly the body and head are black and the wings white, marked with black as follows: In the female (Fig. 48) a small space at the tip and three spots on the outer half of the front wings and one spot on the hind wings; beneath one spot on the front wings, but none on the hind wings, which are commonly yellowish, sometimes passing into green. The male (Fig. 50) has only one spot above and two beneath on the front wings, and a black dash on the anterior edge of the hind wings. There is a variety of the latter sex which has the same markings, but differs from the type in the ground color being canary yellow. Curiously enough, this variety has been taken both in this country and in England.

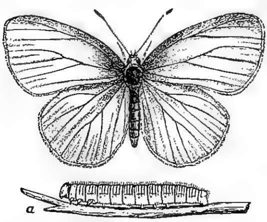
[Fig. 50.]

Colors—Black and white.

These butterflies occasionally assemble in great numbers. At one time a flight crossed the English channel from France to England, and such was the density and the extent of the cloud formed by the living mass, that the sun was completely obscured for a distance of many hundred yards, from the people on board a ship that was passing underneath this strange cloud.

The Potherb Butterfly (*Pieris oleracea*, Boisd., Fig. 51), is the next species to be described.

[Fig. 51.]

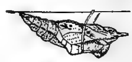


Colors—Black and white; (*a*) green.

It has a very wide range, reaching rarely as far south as Pennsylvania, extending eastward to Nova Scotia, and at least as far west as Lake Superior, while in the north it is found as high up as the Great Slave Lake in the Hudson's Bay Company's territory. This butterfly has a black body; the front wings are white, marked above with black at the base, along the front edge, and at the tip; the hind wings are white above and lemon-yellow beneath, but without markings except a few black scales at the base.

About the last of May numerous specimens of this species may be seen over cabbage, radish or turnip beds, or patches of mustard, where, on the underside of the leaves, it deposits its eggs. These are yellowish, nearly pear-shaped, longitudinally ribbed, and one-fifteenth of an inch in diameter, and are laid seldom more than two or three together. In a week or ten days the young caterpillars are hatched; in three weeks more they have attained their full growth, which is an inch and one-half long. Being slender and green (see Fig. 51, *a*) they are not readily distinguished from the leaves on which they live. They taper a little toward each end, and are densely covered with hairs. They begin to eat indiscriminately on any part of the leaf. When they have completed the feeding stage they quit the plants and retire beneath palings, etc., where they spin a little tuft of silk, entangle their hindmost feet in it, and then proceed to form a loop to sustain the front part of the body in a horizontal or vertical position. Bending its head on one side the caterpillar fastens to the surface, beneath the middle of its body, a silken thread, which it carries across its back and secures on the other side, and repeats this operation until a band, or loop, of sufficient strength is formed. On the next day it casts off the caterpillar skin and becomes a chrysalis (Fig. 52). This is of a pale green and sometimes of a white color, regularly and finely dotted with black; the sides of the body are angular, the head is surmounted by a conical tubercle, and over the forepart of the body, corresponding to the thorax of the included butterfly, is a thin projection, having in profile some resemblance to a Roman nose. The insect remains in this stage for ten or twelve days, when the butterfly appears.

[Fig. 52.]



Colors—Green, white and black.

In the last of July and first of August, these insects may be seen in large numbers depositing their eggs for a second brood, which wintering in the pupa state, produces the perfect insect the following May.

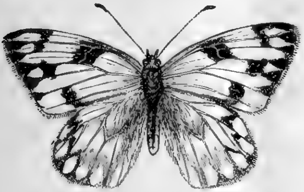
This butterfly varies considerably. There are never, we believe, perfectly white specimens, though often nearly so. Again, some specimens have very faint indications of spots arranged as in *P. rapæ;* but on the underside are found the widest limits of variation, for not only do the tips of the front wings become distinctly greenish, or lemon-yellow, and the veins of that portion bordered with grayish scales, but the hind wings may also have the ground color distinctly greenish, lemon-yellow, or whitish, and the veins display gray scales on each side.

By taking advantage of the habits of these insects, they might be nearly exterminated. If boards are placed among the infested plants, about two inches above the ground, the caterpillars when about to change will resort to them, and there undergo their metamorphoses. They may then be collected by hand on the underside of the boards and destroyed. As the butterflies are slow fliers, they may be taken in a net and killed. A short handle, perhaps four feet long, with a wire hoop and bag-net of muslin or mosquito netting, are all that are required to make this useful implement, the total cost of which need not be more than fifty or seventy-five cents. The titmouse is said to eat the larvæ, and should therefore be protected and encouraged.

The Southern Cabbage Butterfly.

[As the Southern representative of the genus, we will briefly add an illustrated account of the Southern Cabbage Butterfly (*Pieris Protodice*, Boisd.) Mr. S. H. Scudder, from an examination of a large number of specimens, found that

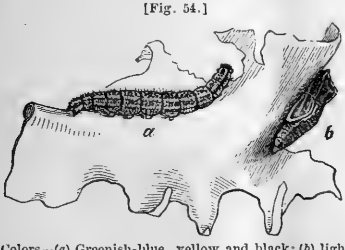
[Fig. 53]



Colors—Black and white.

this butterfly enjoys a wide geographical range, "extending from Texas on the southwest, Missouri on the west, and the mouth of the Red River of the North on the northwest, as far as Connecticut, and the Southern Atlantic States on the east."* But while the species is scarce in the more northern States, it abounds in many of the southern States, where it takes the place of the species described in the above paper. It often proves exceedingly injurious, and we learn from one of our Mississippi exchanges that "there were last year thousands of dollars' worth of cabbages devastated and ruined by worms in the neighborhood of Corinth." We are furthermore told, that cabbages could not, in consequence, be had there even at ten cents per head. The "worm" referred to, was doubtless the species under consideration. It abounds in many parts of Missouri, and especially in the truck gardens around large cities, where it proves quite destructive to the cabbages.

[Fig. 54.]

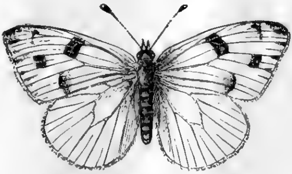


Colors—(*a*) Greenish-blue, yellow and black; (*b*) light bluish-gray.

The larva (Fig. 54 *a*), may be summarily described as a soft worm, of a greenish-blue color, with four longitudinal yellow stripes, and covered with black dots.† When newly hatched it is of a uniform orange color with a black head, but it becomes dull brown before the first moult, though the longitudinal stripes and black spots are only visible after said moult has taken place.

The chrysalis (Fig. 54 *b*), averages 0.65 inch in length, and is as variable in depth of ground-color, as the larva. The general color is light bluish-gray, more or less intensely speckled with black, with the ridges and prominences edged with buff or with flesh-color, and having larger black dots.

[Fig. 55.]



Colors—Black and white.

The female butterfly (Fig. 53), as was stated in our last number, (p. 60) differs remarkably from the male which we represent at Figure 55. It will be seen, upon comparing these figures that the ♀ is altogether darker than the ♂. This sexual difference in appearance is purely colorational, however, and there should not be the difference in the form of the wings which the two figures would indicate, for the hind wings in our ♂ cut, are altogether too short and rounded.

This insect may be found in all its different stages through the months of July, August and September. It hybernates in the chrysalis state. We do not know that it feeds on anything but Cabbage, but we once found a ♂ chrysalis fastened to a stalk of the common nettle, (*Solanum carolinense*) which was growing in a cemetery with no cabbages within at least a quarter of a mile. Before concluding this article, we cannot too strongly urge upon our western readers to do all in their power to prevent the advent of the Rape Butterfly in their midst. It is more to be dreaded than any of the others, and by stringent measures may easily be prevented from gaining a foot-hold in any locality. Be on your guard!—Ed.]

* See Proc. Bost. Soc. Nat Hist., VIII, 1861, p. 180.

† We annex a full description of this larva for the benefit of our scientific friends: Average length when full grown 1.15 inches. Cylindrical. Middle segments largest. Most common ground-color green verging onto blue; sometimes clear pale-blueand at others deep indigo or purplish-blue. Each segment with six transverse wrinkles, of which the first and fourth are somewhat wider than the others. Four longitudinal yellow lines, each equidistant from the other, and each interrupted by a pale blue spot on the aforementioned first and fourth transverse wrinkles. Traces of two additional longitudinal lines below, one on each side immediately above prolegs. On each transverse wrinkle is a row of various sized, round, polished black, slightly raised, piliferous spots; those on wrinkles one and four being largest and most regularly situated. Hairs arising from these spots, stiff and black. Venter rather lighter than ground-color above, and minutely speckled more or less with dull black. Head same color as body; covered with black piliferous spots, and usually with a yellow or orange patch each side—quite variable. The black piliferous spots frequently have a pale blue annulation around the base, especially in the darker specimens.

THE CHEESE-FLY.

BY X. A. WILLARD.

[From the Western Rural of August 19, 1869.]

Most dairymen understand pretty well the habits of the cheese-fly. Many, however, do not know how to provide against its depredations. Some people profess to be fond of skippery cheese, and regard it as an index of what the English understand as "a cheese full of meat," that is, rich in butter. And it must be confessed that the cheese-fly has great partiality for the best goods in the curing house. They do not so readily attack your "White Oak," and skim-milk varieties, hence the notion that cheese affected with the fly is rich in butter is not so far out of the way.

It is an old adage that "there is no accounting for tastes," and whatever may be the merits of skippery cheeses the demand for them is exceedingly small. Indeed, they usually go to the pig-pen or the ducks as food for a lower order of creatures than man. Immense losses are sustained every year on account of skippery cheese. Sometimes thousands of pounds in factories are tainted in this way, and the cheese has to be sold for what it will bring, while a portion is not unfrequently so badly affected that it has to be thrown away at the factory.

The primary cause of skippery cheese, of course, is want of care. Cheese in hot weather should be closely examined every day. They require to be turned once a day in order to facilitate the curing process. The bandages and sides are to be rubbed at the time of turning in order to brush off or destroy any nits of the fly which may happen to be deposited about the cheese. If there are cracks in the rind, or if the edges of the bandage do not fit snugly, they should at once be attended to, since it is at these points that the fly is most likely to make a safe deposit of its eggs. The cracks and checks in the cheese should be filled up with particles of cheese that have been crushed under a knife to make them mellow and plastic. When once filled, a strip of thin tough paper oiled and laid over the repaired surface will serve as a further protection of the parts. The cheese in the checks soon hardens and forms a new rind. Deep and bad looking checks may be repaired in this way so as to form a smooth surface scarcely to be distinguished from the sound parts of the cheese. It is a great mistake to send cheese that have deep checks or broken rinds to market. For, in addition to their liability to be attacked by the fly, they have the appearance of being imperfect, and are justly regarded with suspicion. A few such cheeses in a lot will injure the whole, causing a larger depreciation in price on the whole lot than if the imperfect cheeses had been separated from the rest and sold by themselves for what they would bring.

Some dairymen think that a darkened curing room is best for cheese and at the same time is the best protection against the fly. We think this is a mistake. Cheese cures with the best flavor when it is exposed to light, and besides it can be examined more minutely from time to time, and freed from any depredations of skippers.

August and September are generally the worst months in the year to protect the cheese against attacks of the fly. Some years the trouble is greater than others, and various means have been resorted to for the purpose of avoiding the pest, such as rubbing the cheese over with a mixture of oil and cayenne pepper. These things generally do not amount to much, and are not to be recommended. The best protection is cleanliness, sharp eyes and good care of the cheese. Whenever a lodgment of skippers has been made, they must at once be removed. Sometimes it will be necessary to cut down into the cheese and remove the nest with the knife, but if the colony is young and small in numbers, a thick oiled paper plastered over the affected part so as to exclude the air, will bring the pests to the surface when they may be removed. The oiled paper should again be returned to its place and the skippers removed from time to time, until all are destroyed.

If skippers begin to trouble the cheese, the best course to be adopted is to commence at once, and wash the ranges or tables on which the cheese is placed with hot whey. This will remove all accumulation of grease and nits about the ranges, giving a clean surface which does not attract the flies. If the cheeses also are washed in the hot whey and rubbed with a dry cloth, the labor of expelling the trouble from the curing rooms will be greatly facilitated. We have seen this course adopted with entire success in many instances, when much time and labor had previously been employed without effecting the desired object.

Keep the curing room clean and sweet; see that the cheeses have a smooth rind, that the bandages are smoothly laid at the edges; turn and rub the cheeses daily, and there need be no trouble from the cheese-fly.

[NOTE BY THE EDITOR. — It is only unprofessional readers who will need to be told, that the Cheese-fly (*Piophila casei*) is one of the numerous noxious insects that have been imported into this country from Europe—that it is a small black fly less than half the size of a common House-fly, and belongs to the great Order of Two-winged Flies (*Diptera*) and to the great *Musca* family in that Order, the same Family to which also appertain the House-fly, and our various Meat-flies and Blow-flies — that the female deposits her eggs exclusively on cheese—that these eggs soon afterwards hatch out and produce whitish maggots called "skippers," because these maggots have the remarkable faculty of taking their tails in their mouths and then by suddenly releasing their hold skipping to a distance of several inches—that when full grown the "skippers" have their skins contract lengthways, harden, turn of a mahogany brown color, and assume an oval form technically called "a coarctate pupa"—and that from these pupæ the winged flies soon afterwards burst forth, destined to couple together, and by laying fresh eggs in other cheese produce successive generations in the same unvarying cycle of changes. As with House-flies and Meat-flies, the breed is propagated from year to year by a few fortunate individuals securing in the fly state some uncommonly snug and secure place by way of winter-quarters, the great majority of the last autumnal brood falling victims to their various cannibal foes or to the inclemency of the weather. Hence we see at once why all these insects are far less numerous in the early part of the summer, than they are towards the autumn; for being all of them many-brooded, and laying a very large number of eggs, the breed of them naturally, under favorable conditions of warmth, increases in a fearfully rapid geometrical progression as the summer advances.

We have said that the Cheese-fly breeds exclusively in cheese, because that is the only substance in which the larva is at present known to occur. But of course, before man became so civilized as to take to manufacturing cheese, it must have inhabited some analogous substance—a peculiar kind of fungus for example—which perhaps existed only in very small quantities and was scattered widely over a large extent of country. Hence, under such circumstances as these, it was probably, like many other such flies, only to be met with in very small numbers. It is the manufacturing cheese in great quantities, and especially the concentrating the cheese in a few localities, instead of scattering it broadcast over the whole country, that affords such facilities for the great multiplication of the species. But as we have enlarged more fully upon this last point in our Article on the Increase of Noxious Insects, we need not dwell upon it here.]

THE HARLEQUIN CABBAGE-BUG.

(*Strachia histrionica*, Hahn.)

Cabbage-growers in the North are apt to think, that the plant which they cultivate is about as badly infested by insects as it is possible for any crop to be, without being utterly exterminated. No sooner are the young cabbages above ground in the seed-bed, than they are often attacked by several species of Flea-beetles, one of which, the Wavy-striped Flea-beetle, we figured and illustrated in all its stages in the 8th number of our First Volume (pp. 158–9). By these jumping little pests the seed-leaves are frequently riddled so full of holes that the life of the plant is destroyed; and they do not confine themselves to the seed-leaves, but prey to a considerable extent also upon the young rough leaves. After the plants are set out, the larva of the very same insect is found upon the roots, in the form of a tiny elongate six-legged worm. Through the operations of this subterranean foe, the young cabbages, especially in hot dry weather, often wither away and die; and even if they escape this infliction, there is a whole host of cut-worms ready to destroy them with a few snaps of their powerful jaws; and the common White Grub, as we know by experience, will often do the very same thing. Suppose the unfortunate vegetable escapes all these dangers of the earlier period of its existence. At a more advanced stage in its life, the stem is burrowed into by the maggot of the Cabbage Fly (*Anthomyia brassicæ*)—the sap is pumped out of the leaves in streams by myriads of minute Plant-lice covered with a whitish dust (*Aphis brassicæ*)—and the leaves themselves are riddled full of holes by the tiny larva of the Cabbage Tinea (*Plutella cruciferarum*), or devoured bodily by the large fleshy larvæ of several different Owlet-moths.* Nor is this the end of the chapter. The Cabbage-fly, the Cabbage-plantlouse, and the Cabbage Tinea were long ago imported into this country from Europe. There is a still more savage foe to the cabbage, that is just beginning to make his way among us from his native home on the other side of the Atlantic. One of the White Butterflies (*Pieris rapæ*, see Figures 48 and 50 in this number) that in Europe are such a plague to the Cabbage grower was introduced accidentally into Canada some six or eight years ago; and already it is spreading into the United States in all directions with giant strides, having up to this date occupied and possessed the more northerly parts of New England, and as we learn from Dr. Hoy of Milwaukee, Wisconsin, being now tolerably common in his neighborhood.

[Fig. 56.]

Colors—Shining black and bright yellow.

Severe as are these inflictions upon the Northern Cabbage-grower, there is an insect found in the Southern States that appears to be, if possible, still worse. This is the Harlequin Cab-

* *Mamestra picta*, *Plusia precationis*, another *Plusia*, and two or three different *Agrotidians*.

bage-bug (*Strachia histrionica*, Hahn, Fig. 56), so called from the gay theatrical Harlequin-like manner in which the black and yellow colors are arranged upon its body. The first account of the operations of this very pretty but unfortunately very mischievous bug appeared in the year 1866 from the able pen of Dr. Gideon Lincecum, of Washington county, Texas, and were printed in the *Practical Entomologist* (Vol. I, p. 110). His remarks are to the following effect:

The year before last they got into my garden, and utterly destroyed my cabbage, radishes, mustard, seed turnips, and every other cruciform plant. Last year I did not set any of that Order of plants in my garden. But the present year, thinking they had probably left the premises, I planted my garden with radishes, mustard, and a variety of cabbages. By the first of April the mustard and radishes were large enough for use, and I discovered that the insect had commenced on them. I began picking them off by hand and tramping them under foot. By that means I have preserved my 434 cabbages, but I have visited every one of them daily now for four months, finding on them from thirty-five to sixty full-grown insects every day, some coupled and some in the act of depositing their eggs. Although many have been hatched in my garden the present season, I have suffered none to come to maturity; and the daily supplies of grown insects that I have been blessed with, are immigrants from some other garden.

The perfect insect lives through the winter, and is ready to deposit its eggs as early as the 15th of March, or sooner, if it finds any cruciform plant large enough. They set their eggs on end in two rows, cemented together, mostly on the underside of the leaf, and generally from eleven to twelve in number. In about six days in April—four days in July—there hatches out from these eggs a brood of larvæ resembling the perfect insect, except in having no wings. This brood immediately begins the work of destruction by piercing and sucking the life-sap from the leaves; and in twelve days they have matured. They are timid, and will run off and hide behind the first leaf-stem, or any part of the plant that will answer the purpose. The leaf that they puncture immediately wilts, like the effects of poison, and soon withers. Half a dozen grown insects will kill a cabbage in a day. They continue through the summer, and sufficient perfect insects survive the winter to insure a full crop of them for the coming season.

This tribe of insects do not seem liable to the attacks of any of the cannibal races, either in the egg state or at any other stage. Our birds pay no attention to them, neither will the domestic fowls touch them. I have, as yet, found no way to get clear of them, but to pick them off by hand.

It appears from this statement that there are at least two broods of the species every year, the first hatching out in April and the second in July; and as it is said that only 16 or 18 days elapse from the deposition of the egg to the mature development of the perfect bug, it is not improbable that the species is in reality many-brooded. The eggs, of which we have specimens now before us, are about 0.03 inch in diameter, barrel-shaped, and of a greenish-white color with two broad black bands encircling the staves of the barrel so as to look exactly like hoops. To afford a passage to the young larva, one of the heads of the barrel—the one, of course, that is not glued to the surface of the leaf—is detached by the beak of the little stranger as neatly and as smoothly as if a skillful cooper had been at work on it with his hammer and driver. And yet, instead of employing years in acquiring the necessary skill, the mechanic that performs this delicate operation with unerring precision, is actually not as yet born into this sublunary world!

Hitherto it had been generally supposed by entomologists that the Harlequin Cabbage-bug was confined to the most southerly of the Southern States, such as Texas and Louisiana; and it had consequently been called by some "the Texan Cabbage-bug," instead of translating the scientific name and calling it, as we have done, "the Harlequin Cabbage-bug." In September, 1867, however, we received numerous living specimens from Dr. Summerer, of Salisbury, in North Carolina; and from his account it seems to be as great a pest in the gardens of that State as Dr. Lincecum describes it to be in Texas. Hence the species is most probaby to be met with, in particular localities and in particular seasons, throughout the Southern States, at least as far north as Tennessee and Arkansas; and we should not be surprised if a few specimens were eventually to turn up in Southern Illinois, and in Southern Missouri.

It is said that no criminal among the human race is so vile and depraved, that not one single redeeming feature can be discovered in his character. It is just so with this insect. Unlike the great majority of the extensive group (*Scutellera* Family, Order of Half-winged Bugs) to which it belongs, it has no unsavory bedbuggy smell, but on the contrary exhales a faint odor which is rather pleasant than otherwise. We have already referred to the beauty of its coloring. As offsets, therefore, to its greediness and its thievery, we have, first the fact of its being agreeable to the nose, and secondly the fact of its being agreeable to the eye. Are there not certain demons in the garb of angels, occasionally to be met with among the human species, in favor of whom no stronger arguments than the above can possibly be urged?

THE DROP-WORM AGAIN.

Dear Sir:—I read your account of the Drop-worm (*Thyridopteryx ephemeræformis*) with a great deal of interest, which in the main corresponds with my own experience, but there are some *facts*, in connection with this insect, which seem to have escaped your observation, or which differ in some measure from mine. I commenced my observations in 1849, and continued them for two or three years. A large linden tree grew near the window of the room in which my observations were made, some of the branches reaching quite to the window-sill, and this tree must have had some thousands of this insect upon it. In this situation, the young insects came forth from the follicle, from the 25th to the 30th of May, each one letting itself down by a separate minute silken cable, and they formed their first cone-shaped cases out of the epidermis of the bark on the branches. Those that were excluded in my room, formed them out of lime on the walls, leather on the backs of some of my books, and straw-matting on the floor. Some of the females, that were not impregnated by the males, *did leave the follicle entirely, without ovipositing*, and had a feeble power of locomotion, on a plain horizontal surface, moving two or three inches during the course of half a day. This was done by elongations and contractions of the body, maggot-like, but less active. Immediately when the males evolve from the pupa, in a state of nature, their wings are not glassy, except a very small portion near the outer margin. They are opaque, being covered with a dark coating of the mealy substance which distinguishes the *Lepidoptera*, but they soon become transparent, by the action of flight. Those that evolved in confinement were nearly always glassy, especially after they had attempted to make their escape. The late Major LeConte confirmed this observation of mine by his own experience. Again, have you ever witnessed the male in the *act* of impregnating the female? I have, in at least twenty instances, and in no case, *immediately*, after he withdrew his abdomen from the follicle of the female, did her body protrude from the puparium. It had the **T**-shaped opening on the top of the thorax, but the entire body of the female remained within it. The act of protrusion was always simultaneous with the act of oviposition. In fecundating the female, the male introduces his abdomen into the opening at the lower end of the sack, as far as his wings will admit it, and he remains thus from fifteen to twenty minutes. It is true that the abdomen of the male is capable of a great elongation, but by stretching it artificially to its utmost extension, I never, by measurement, could reach any way near the anal extremity of the female, which you know is, at this time, at the opposite end of the sack, and which, according to your quotation from Harris, would be utterly impossible, unless there existed a long thread-like sexual organ—fully the length of the whole extended body—sufficiently attenuated to pass between the body of the female and her pupa skin. I have never discovered such an organ, although I am not prepared to say positively that it, or something analagous to it, does not exist. My impression is, that it is not absolutely necessary. The female is so exceedingly simple in her structure, that fertilization is made possible by the mere "overshadowing influence" of the male, made at the only vulnerable point of contact, which is through the **T**-shaped opening on the thorax. I have had the denuded females and the males boxed up together, but there seemed to be no recognition between them, but as soon as I introduced the follicle of an unimpregnated female, a male would discover it, and couple with it almost immediately.

I published a long paper, containing my observations on this insect, in the *Penna. Farm Journal* in 1853 or 4, calling the attention of the people to it, and suggested the simple remedy you did. Some five or six years afterwards it was republished in the *Farmer and Gardener*, and subsequently also in a weekly paper in this city, but it appears to me that the people don't read, or immediately forget what they read, for some seasons the insect becomes still very destructive, and they "don't know what to do about it." S. S. Rathvon.

Lancaster, Pa., Dec. 1, 1869.

THE HATEFUL, OR COLORADO GRASSHOPPER.

(*Caloptenus spretus*, Uhler and Walsh.)

C. V. Riley—*Dear Sir:* A summary of my investigations in regard to the Hateful, or Rocky Mountain Grasshopper (*Caloptenus spretus*), during my recent trip through Colorado and New Mexico, may be interesting. But you are aware that it takes several years to study thoroughly the habits of any insect, especially of one as widely distributed and variable in its habits as this grasshopper.

I will first give the *facts* which came under my own observation. But to do this with any degree of completeness, I shall have to repeat a portion of what is already written in my "Notes on the Agriculture of Colorado."

June 17, 1869, I met with them at St. Joseph, Mo., in the perfect state, where they were sufficiently numerous, even in the city, to darken the walls of the hotel at which we stopped. We arrived very early in the morning, and then they appeared to be somewhat torpid; yet when those in the grass were disturbed by the hogs, which were feeding upon them, they hopped about quite briskly. Swarms of them, as I was informed, had been flying over that section for a week previous to our arrival. Here, as at most points were I found them, I gathered specimens. Considerable rain, as you remember, had fallen during the previous month, the season being unusually wet.

I saw none at Omaha next day, but as I had no time to look for them, I cannot state positively as to their presence at this point.

At Cheyenne (June 20–29) I saw the larvæ and pupæ in considerable numbers, but after search of several days succeeded in finding two or three in a perfect state.

At Laporte, on Cache-a-la-Poudre (July 1–2), I saw very few, although I searched carefully both the bottoms and ridges. Yet next day, on Big Thompson creek (twenty miles south), I found them somewhat numerous, in the perfect state, apparently fresh from the last moulting. From this point to Clear Creek but few were observed. At the latter point (July 7–14), they were in moderate numbers, undergoing their last moulting. The early oats here had suffered from the attacks of grasshoppers, but I am satisfied this could not be attributed wholly to any *one* species, as several were about equally numerous.

From Denver we moved westward into the mountains (July 15–27), where I found the narrow valleys and canons—after we had passed the first range—swarming with them in the perfect state. Often, when the wind blew moderately, they filled the air, looking like large flakes of snow. I traced them not only along the canons as far west as Berthoud Pass, but up the mountain rim of Middle Park to its crest, above the perennial snows that fringed its summit. Here, too, I found them quite active on the sunny and windward side of the crest where it was bare. And strange as it may appear, on the top of one of the highest peaks in the vicinity of the Pass I saw a pupa quite active. Also on the surface of the snow I procured specimens of the perfect insect alive, though benumbed with cold. I was informed by a gentleman who crossed the range a little farther south a few days previously, that as he was coming over, he saw a bear and cub on the snow eating grasshoppers.

During our journey southward from Denver to Santa Fe (Aug. 6—Sept. 7), I observed this species in limited numbers at various points along our route, which was near the base of the mountain, but not in greater abundance than other species. There were also sections of considerable extent where none were seen, other species replacing them. For example, on the plains bordering the Arkansas, the unwieldy *Brachypeplus magnus*, Girard,* was often the most abundant species.

On the more elevated plateaus, or mesas, other smaller and more active species were found most numerous.

One or two large areas of dry parched land I found almost entirely free from grasshoppers.

I noticed that where *Artemisia* or *Obione* chiefly covered the ground, as is often the case, the Hateful Grasshopper was seldom seen. But in such spots, from Canon City south, another small green species is found in abundance.

Returning north from Santa Fe by way of Taos and through St. Luis valley and South Park (Sept. 14–30), I saw occasional individuals throughout the whole distance, yet at no point was this species (*C. spretus*) numerous.

Perhaps I ought to remark in this connection, that the *Oedipoda corallipes*, Hald., was found at a few points, viz., in moderate numbers about Cheyenne; a few on the "Divide" between the South Platte and Arkansas; and on each side of the Raton Mountains.

The statements received from citizens along our route in regard to the habits and history of the "Hateful Grasshopper" were so indefinite that but little knowledge was gained thereby. These statements were doubtless correct and and honestly made, but failing to distinguish sharply between species, and as to dates, etc., were of so general a character that they added but little to what was already known. The articles of Messrs. Byers and Devinny in the ENTOMOLOGIST of January, 1869, contain the substance of all I thus received.

I am not acquainted with Mr. Devinny, but Mr. Byers, the able Senior of the *Colorado News*, and one of the proprietors of the noted Hot Springs of Middle Park, is undoubtedly well posted in regard to the history and habits of this insect in that section. Yet while

*The green variety or species (*B. virescens*, Charp.) and the reddish-brown (*B. magnus*) were found together. I say "variety," because I am inclined to think they belong to the same species. I doubt very much whether any difference will be found between the alcoholic specimens. It is possible that the Mexican insect of Charpentier differs from this green variety.

I agree with him in regard to the facts, I must demur to some of the conclusions he draws therefrom, in his article on page 94 of your first volume.

"The greater the heat the more they flourish," is true with most grasshoppers. And as a general thing the drier the season the more abundant will the troublesome species become. My information accords with Mr. Byers' statement that the greatest injury is done by the broods hatched on the plains. It seems to be a general understanding in that section that when a heavy fall swarm comes down from the mountains, the next spring brood will be numerous and destructive. But the inference he draws from this fact, to-wit, that its native home is not in the canons of the Rocky Mountains, but the hot parched plains and table lands, is not legitimate.

1. *As shown from facts stated in his own article.* It is not likely that an insect whose native breeding place is the hot parched plain, would often be seen flying across the cold snowy peaks around Middle Park, a hundred miles distant from the nearest western plain of this character. It is also strange that the worst visitation of an insect, native to the hot parched plains in the latitude of Denver, should come from the valleys of the Upper Missouri, six or eight hundred miles farther north, along the Rocky Mountain range. It is apparent that Mr. Byers' theory will not agree with his facts.

2. *As shown by my own observations.* The present year (1869), as will be admitted by all observers, was not a migratory season with them in Eastern Colorado, hence they would be seen in their normal condition, or nearly so.* By reference to my notes as given above, it will be seen that while they appeared in comparatively small numbers on the plains, they were abundant and active in the mountain canons.

I camped in the valley immediately east of the snowy rim of the Middle Park, near Berthoud Pass, for six days (July 21–27). This is a narrow valley with a snow-capped range on each side; the bottom, as marked near the margin of the clear cold creek, nine thousand five hundred feet above the level of the sea. Here day after day I watched these insects rising and filling the air like flakes of snow in a winter storm. Turning their heads against the wind as they arose, they were borne backwards by the wind, which seemed to be their only method of making long flights. Hence I think Mr. Byers is correct in saying that "their course is directed by the prevailing winds more than by any other influence." And as he says, each individual seemed to move on its own account and not in concert, the atmospheric and other influences inducing them to rise at the same time. The strokes of their wings, together with the wind—when not too strong—has a tendency to carry them upwards. Rising to the tops of the ranges with the local current, here they enter into the upper current, which, moving generally in an easterly direction, carries them over on the plains. If the upper current is strong and cold it has a tendency to chill them, and if they pass close to the summit as they go over the range, the flexure of the upper portion dashes many of them on the snow which is found in such places. Whether the heavier atmosphere on the low plains enables them to direct their course or not, is perhaps, a matter yet undetermined.

The pupa which I saw on the crest of the range, and *about which I am not mistaken,* (I think I saw others), shows that they hatch out at great heights. Numbers both of larvæ and pupæ were seen on the mountain side. I traced this species up the self-same rim, of which Mr. Byers speaks, step by step to the snow, decreasing in numbers, of course, as I ascended, but active to its very margin, and even above it on the crest, and that there might be no mistake I gathered specimens. I also searched carefully for other species, but found very few specimens, and these low down in the valley; though on the ridges around the Boiling Springs, near Colorado City, I found another species more abundant than the *spretus.* This latter species I found in but few places, and always on elevated points, and when it was present the *spretus* was absent or very scarce.

I will call attention here to a remark made by Say which bears on the subject and confirms the statement in regard to broods hatched exterior to the mountains. It is found in his report of Hemipterous Insects collected during Maj. Long's Expedition, under *Gryllus bivittatus* (Ent. Le C. II., 238). "This species, with several others, occurred in great numbers near the mountains, and on one occasion we observed this species, with several others, ascending to a great height in the air as if to commence a migration to a remote region."

I am clearly of the opinion that the native abode and breeding place of this insect is in the mountain valleys and canons, and that in Colorado the direction of its flight is governed by the wind. It is also certain that those seen at St.

*I assume as granted that the enormous development of any species of insect, as the Migratory Locust, Army Worm, etc., are aberrations from their normal condition, superinduced by a combination of favorable influences.

Joseph June 17, did not come from the mountains or even from Colorado. The various states of advancemet in growth at different points without regard to latitude, elevation, or climate, show that the broods are local, or were local the present year. Their invasions of the country east of the Rocky Mountains, as given in the December (1868) number of the *Am. Entomologist,* 1820, 1856, 1857, 1864, 1866, 1867, and 1868 (Taylor, Smithsn. Rep. 1858 adds 1855), show that they are not governed by any regular periodic habit or influence. Observation shows that ordinarily their habits on the plains are very similar to those of the Red-legged Grasshopper (*C. femur-rubrum,* De Geer). I am inclined to the opinion that damp seasons are unfavorable to their development (but I will not take time at present to give my reasons for this opinion).

Do they cross the plains from the mountains in one season? Or, does the same swarm travel this distance? I cannot answer positively, No; yet I am of the opinion that they do not. But it may be asked, "Upon what do you base this opinion?" 1. The opinion of those in Colorado with whom I conversed on the subject (yet it is but an opinion) is that no one brood travels more than thirty to fifty miles. 2. The distance is so great that it raises the presumption they do not, which must be rebutted by some proof, which, so far as I am aware has not been furnished—unless their appearance in Kansas from the west be taken as such proof. 3. As they depend upon the wind—near the mountains—to carry them, it is very likely they depend upon it on the plains. And as they are really battling against the wind during the flight, their progress is somewhat slow. Hence it would require a long-continued series of favorable winds to bear them so great a distance. (Be it remembered I have seen them flying only in the mountains, and on the plains near the base of the mountains). 4. If they alight on the plains, as they often do in the mountains when the wind suddenly ceases blowing, coming down like a pebble, their wings would be worn out by the cacti and rough plants, long ere they had traveled five hundred miles. 5. The swarms which come from the mountains to the plains near the base certainly do not proceed far eastward. What reason then have we for believing the next brood arising from their eggs will enter upon so long a journey?

But this matter cannot be settled until more facts have been obtained.

There appear to be several varieties, varying from a straw-color to a dark brassy or greenish-brown, the head and sides of the thorax often almost black, yet retaining all the other markings. Age appears to deepen the color.

Yours, etc., truly, C. THOMAS.

DE SOTO, Ills.

AN ENTOMOLOGIST CAUGHT NAPPING.

Americans, most of them having been raise in a timbered country, naturally consider that he normal condition of the earth is to be covered by forests of trees. Hence we can scarcely take up a scientific journal, without finding some ingenious new theory to account for the existence of our western prairies. These philosophers forget that, in the interior of Australia, on the Pampas of South America, and in the great African Sahara, you may travel for thousands of miles without seeing a single tree; and that it is no more the normal condition of the earth to be covered by a dense growth of woody plants, than it is to be covered by a dense growth of herbaceous phenogamous plants, or a thick carpet of lichens and mosses. To every soil and climate a peculiar vegetation is appropriated; and it is as ridiculous to say that trees are the natural and normal growth of the whole surface of the earth, as it is to maintain that twelve is the normal and natural number of a jury.

It is amusing to see how men who live in a grass country hold precisely the contrary doctrine to that held by those who have been reared in a timber country. "Grass especially," says the English entomologist, John Curtis, "is the NATURAL COVERING OF THE SOIL, which has been increasing in depth and bulk from the creation." (*Farm Insects,* p. 498). If Curtis had not been better informed in entomology than he seems to be in botany, his works would not find so many readers as they do. Entomologists and other specialists will generally find it the safest course not to meddle with subjects that they do not understand. "Let not the cobbler go beyond his last."

THE PROGRESS OF THE POTATO BUG.

An interesting account of the Colorado Potato Bug (*Doryphora 10-lineata,* Say), is given in some of the former numbers of the AMERICAN ENTOMOLOGIST. It states that, starting eastward from the Rocky Mountains in 1859, this insect had already in 1868 reached the south-west corner of Michigan, and Danville in Indiana, about the centre of that State; making its average annual progress about sixty-two miles. Another writer says that "the southern columns of the grand army lagged far behind the northern columns." Last summer (1868), to my own knowledge, it had reached the south shore of Lake Superior, northwest corner of Michigan, where it abundantly manifested its presence in its usual destructive attacks on the potato. I have since learned that between the Potato Bug and the drouth of the early part of the season, the crop was well nigh ruined in that region. I shall not easily forget the appearance of one potato field I witnessed, on the lake shore, in northeastern Wisconsin, which was nearly covered with those pests in both the larva and perfect states. The lazy Indians, to whom it belonged, idly lounging in the sun, and probably ignorant of the noxious character of the insect, made not the slightest effort to stay the work of destruction.

Its march this summer (1869) through Michigan has been duly recorded, though, owing to various causes, not attended with the dire consequences anticipated, as the price of potatoes in Detroit would go to show, they selling here, last fall, at from thirty-five to forty cents per bushel. HENRY GILLMAN.

DETROIT, Michigan.

A SO-CALLED "VULGAR ERROR" NO ERROR AT ALL.

It is the common belief among farmers that barberry bushes sometimes cause rust in wheat; and not long ago there was a very serious riot in a certain county in Iowa, because one of the citizens persisted in growing barberries, to the great detriment, as was insisted on, of his neighbors' wheat crops. The above belief is referred to in the following extract from the *Proceedings of the N. Y. Farmers' Club*, Sept. 14th, 1869:

INFLUENCE OF CERTAIN TREES ON CROPS.—E. B. Seelye, Hudson, Mich., says, in his opinion, rust in wheat is produced by the barberry bush.

Dr. Trimble—This is an old tradition that I have heard from a boy, but there is no foundation for the belief. Rust is produced by another class of causes.

S. Edwards Todd—I am of the same opinion, but I know there are hundreds of farmers who have a prejudice against the barberry on this account. But I have seen the finest crops of wheat growing close beside the bush spoken of.

It would seem, however, although the belief that barberry often causes a particular kind of rust on wheat has been for the last century very generally ridiculed by naturalists as a popular superstition, that for this once the naturalists are in the wrong and the poor despised and vilified farmers are in the right. Here is what Dr. Lütken of Copenhagen, Sweden, says upon this vexed question in the *American Naturalist* for December, 1868, (page 557):

Professor Œrsted continues his curious experiments, demonstrating that certain fungi, parasitic on different species of plants, and described as distinct genera and species, are in reality only *the alternate generations of one species.* * * * You will remember that the specific identity of *Puccinia graminis* and *Oidium berberidis* was in the like manner demonstrated some years ago through the almost contemporary experiments of De Bary and Œrsted; thus confirming the opinion for a long time fostered by farmers, but rejected as superstitious by most naturalists (Sir Joseph Banks excepted), on the obnoxious influence of the Barberry on the grain-fields.

"Bully for the farmers," we say! Scientific men are sometimes a little too apt to despise the observations of plain practical men as "unreliable and worthless." See for example Dr. Shimer's fling at the different State Entomologists for relying on the statements of mere "correspondents."* Now here, as it turns out, we have a clear case where the farmers are in the right and almost every naturalist has been in the wrong. Let us then humbly and meekly "confess the corn." Probably, if the farmers would use the pen as often as they use the plough, we should have plenty more such cases.

But we fear that we are "stealing the thunder" of the Illinois State Horticulturist by talking so long on the great mysterious Fungus Question. We shall, therefore, leave this matter for his final decision, in the hope that he will take care to give the farmers "a fair shake."

*Trans. N. Ill Hort. Soc. 1867-8, p. 101.

POISONOUS QUALITIES OF THE COLORADO POTATO BUG.

As corroborative testimony of the poisonous character of the Colorado Potato Bug (*D. 10-lineata*, Say), we quote the following from the Spring Valley (Minn.) correspondence of the Winona *Republican*:

A number of cases of poisoning from the loathsome potato bug have recently occurred in this vicinity, which I think are deserving of attention. As many persons are in the habit of killing these bugs by mashing them with sticks, and sometimes even between their fingers, I will cite one particularly severe case, which, it is hoped, will serve as a warning to those who take either of the above "mashing" methods to rid themselves of these disgusting potato destroyers.

Mr. Calvin Huntley, residing about three miles south of the village, has spent considerable time during the past two weeks in his potato patch, killing the bugs that infest the vines, by mashing them between two flat sticks. One evening about a week since, he accidentally got some of the blood or juice upon his wrist. Thinking no harm would result therefrom, he paid no attention to it. On rising the next morning he experienced an itching sensation on and about the wrist, which had become swollen, and presented an inflamed appearance, extending along the cords of the arm to the shoulder blade, beneath which a hard kernel had formed, in size nearly as large as a common hickory nut. The inflammation rapidly increased, and upon the particular spot where he had noticed the blood, there is a very painful sore, which looks as if it had been caused by the application of some rank poisonous substance. A hole has been eaten in the wrist, which is now quite deep, and is fast making its way to the bone. The whole arm is badly swollen and inflamed, and Mr. H. has placed himself under the charge of Dr. J. E. Whitman, of this place, who is endeavoring to counteract the poison communicated to the system of the patient from the blood of the potato bug.

It has long been admitted that the potato bug is a poisonous insect, but I apprehend the case of Mr. Huntley will tend to make all under whose observation this article may fall, still more careful how they handle them in the future. There are a number of others here whose blood has become poisoned in the same manner, causing pimples to appear on the skin, which, however, are confined to the hands, and are not seen on any other part of the body.

Potato bugs can be killed with less trouble and danger, by sprinkling the vines lightly with Paris green, which is also a deadly poison. This is the most effectual means yet discovered of disposing of the potato bug, which has destroyed so many crops in the country. The eggs that have accumulated upon the vines will not hatch after an application of Paris green. Let those of our readers who are trying to raise potatoes try this plan, if they wish to realize anything from their ground and labor.

We have lately received a copy of an essay read before the Cook County (Ill.) Homœopathic Society, by Dr. E. M. Hale, in which many other authentic cases are given, of persons being poisoned by this insect.

OF WHAT USE IS ENTOMOLOGY?

The subjoined extract is from a recent number of the Canada Farmer:

Not many years ago this was the question very commonly addressed to Entomologists and collectors of insects by those who chanced to find them engaged in their favorite pursuit; and even now there are not a few who look upon the study as a mere waste of time, or at best a harmless amusement. But—to use a favorite expression of the day—"public opinion is being educated up to a higher appreciation" of the importance of insects to our welfare and comfort, and that too by the hitherto despised insects themselves. For what farmer can now think insects too insignificant to be worthy of notice, when he finds that one of the tiniest of them ruins his wheat-fields and robs him of hundreds and thousands of dollars? What gardener but must confess that it is high time he knew something about insects, when his currant and gooseberry bushes are leafless and fruitless, his plum-trees a perfect failure, his peaches nowhere, his cabbages no sooner planted than cut off, his grape-vines desolated with myriads of foes—in fact, almost everything that he grows attacked, root, branch, leaf and trunk? What orchardist but must acknowledge the power and restless activity of the borer in the trunks of his young trees, the caterpillars on the leaves, the bark-lice on trunk and branches, the worms in the very core of the fruit itself? What hop-grower but feels himself by sad experience utterly at the mercy of the aphis and green caterpillar? What furrier but loathes the Dermestes and other beetle larvæ? What timber-merchant but has had to race with the pine-borer for the coveted fire-scorched track of the forest? What butcher but groans and perspires, even in chilly December, at the very thought of the blow-fly? What housewife but has been half-stifled with camphor and pepper in warding off the clothes-moth from her treasured store? What—but we need not go on with the list, for who is there that has no complaint to make of trouble, loss, or annoyance occasioned by these tiny but omnipresent foes? Can then a study be pronounced useless or contemptible, which has for its object the acquirement of accurate knowledge of the life and habits of all these myriad foes, and not only of them, but also of the thousands of useful insects besides? Until this accurate knowledge be obtained, we fight in the dark, and cannot tell friend from foe, but are just as likely to destroy our most useful ally as our most destructive enemy; and unless we are thoroughly acquainted with the life and habits of these pests we cannot apply a remedy with any certainty as to its value or success.

A NEW INSECTICIDE.

M. Cloez, who is engaged at the garden of the Paris Museum—the world-renowned Jardin des Plantes—has invented what he considers a complete annihilator for plant-lice and other small insects. This discovery is given in the *Revue Horticole*, with the endorsement of its distinguished editor, E. A. Carriere. To reduce M. Cloez's preparation to our measures, it will be sufficiently accurate to say, take three and one-half ounces of quassia chips, and five drachms Stavesacre seeds, powdered. These are to be put in seven pints of water and boiled until reduced to five pints. When the liquid is cooled, strain it, and use with a watering pot or syringe, as may be most convenient. We are assured that this preparation has been most efficacious in France, and it will be worth while for our gardeners to experiment with it. Quassia has long been used as an insect-destroyer. The Stavesacre seeds are the seeds of a species of Larkspur, or *Delphinium*, and used to be kept in the old drug stores. Years ago they were much used for an insect that found its home in the human head, but as that has fortunately gone out of fashion, it may be that the seeds are less obtainable than formerly. The Stavesacre seeds contain *Delphine*, which is one of the most active poisons known, and we have no doubt that a very small share of it would prove fatal to insects.—*American Agriculturist.*

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund, and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

The Handsome Digger Wasp as a Horse Guard—*Clarksville, Texas, Aug.* 10, 1869.—I send you a large solitary wasp which is called

[Fig. 57.]

Colors—Black and Cream-color.

here the "Horse-Guard." They are true to name, for they play around horses and cattle, and catch the horse-flies, which they take to their burrows to feed their young. I dug out a nest this afternoon which had five horse-flies and but one larva. A. H. R. Bryant.

[The specimen sent was the Handsome Digger Wasp (*Stizus speciosus*, Drury), a figure of which we reproduce above (Fig. 57). It is the habit of Digger wasps to deposit but one egg in each of their burrows. The species in question has long been known to provision its nest with Grasshoppers, but we believe that no species of the genus (*Stizus*) has hitherto been recorded as using Horse-flies for this purpose. There is, however, a more common genus of Digger Wasps (*Bembex*) which does provision its nest exclusively with Athericerous Diptera (Horse-flies, etc.), and as some species of *Bembex* are marked much like the Handsome Digger Wasp, we have our suspicions that Mr. Bryant has confounded these insects, and has sent us one that was not really doing this Horse-guard business. At all events, we shall be glad to hear from Mr. B. again on this subject, because in a scientific sense it is one of great importance. We have strong faith in what has been called the *Unity of Habits* in insects, and the only two N. A. species of *Stizus*, the habits of which are known (*grandis* and *speciosus*) provision their nests with Harvest-flies (*Cicada*) and Grasshoppers.]

A "Locust Year" for Tennessee—*Savannah, Tenn., Dec.* 2, 1869.—While digging in an Indian mound to-day I unearthed three Cicada pupæ. They were about nine inches below the surface, and each had for himself a neat little room about the size of a quail's egg. All were as perfect and as lively as if just ready to shed their coats. J. P. S.

[Unless the pupæ seen by our correspondent were those of some species which makes an annual appearance, we strongly suspect them to belong to that brood of the 13-year Cicada which is to appear in 1872. This is the Brood V. of the *Am. Entomologist* (see Vol. I, p. 68), but is equivalent to Brood VII. of our Missouri Entomological Report, where, on the authority of the late Dr. Smith, of Baltimore, Md., it is recorded in De Kalb, Gwinnett and Newton counties, Georgia, in 1846 and '59; in the northern part of Tennessee also, in 1846 and '59; in the whole eastern portion of Mississippi from the ridge which is forty-five miles from the river, on the west, to the eastern boundary, in 1820, '33, '46, and '59; in Carrol Parish, Louisiana, in 1859; and in Philips county, Kansas, in the same year. The growth of this insect is so very gradual that the pupæ appear full grown for several years before they really issue from the ground. We dug up a number in the fall of 1868, in Union county, Ills., which evidently belonged to this same brood, and will not consequently issue from the ground till 1872; and yet they could then scarcely be distinguished from such as had been dug up in other parts of the State in the spring of the same year, and which were just ready to transform.—Ed.]

Parasitic Mites on the House-fly—*Vineland, N. J., Oct.* 22*d*, 1869.—I found a House-fly the other day almost covered with minute red parasites. They were under the wings, on the abdomen and legs, and even in the cavity of the mouth. I put the fly in a box, where it soon died. I then introduced another fly, and after a few hours, on opening the box, I found that many of them had fastened themselves to this second fly. I could see them distinctly with the naked eye crawling about the box, as well as on the fly. Mrs. Mary Treat.

The Tomato-worm—*Vineland, N. J., Sept.* 26*th*, 1869.—The other day I found a full-grown tomato-worm (*Sphinx 5-maculata*) feeding upon Ground Cherry (*Physalis viscosa*); and last summer I found one feeding upon Matrimony-vine (*Lycium barbarum*). This makes at least five different plants belonging to this Family that I have found this larva feeding upon.

Mrs. Mary Treat.

Rocky Mountain Grasshopper cannot live in Pennsylvania—*Lancaster, Pa.*—Early last spring (about the beginning of March) *somebody* sent me, through the mail, a small box of grasshopper's eggs, from Leavenworth, in Kansas. They were whitish, oblong, and arranged diagonally in oblong pellet-like masses, covered with a dark-colored glutinous substance. There were probably five hundred in all. Some of these eggs I put in a small box, and others I put in a jar, half full of moist earth, which I set, in a sort of conservatory, among some plants. Those in the box hatched out a week earlier than those on the moist earth, although the temperaure of the two places was about equal. Of course all those in the box starved for the want of food. About the middle of March they made their appearance in the form of a very active little black grass-hopper, which I took to be the young of the Rocky Mountain Grasshopper (*Caloptenus spretus*, Uhler). Those in the jar were carried to the garden along with the plants about the first of April, where the jar was accidentally upset, and the little "hoppers," about one hundred and fifty in number, all made their escape. But they, too, must also have all perished, for with my utmost vigilance during the whole summer, I never got a sight of a single one of them again. I conclude, therefore, that our climate is "unwholesome" to the Rocky Mountain species, although the Red-legged species (*C. femur-rubrum*, De Geer) lives and flourishes here.

S. S. R.

Tomato Worm Parasites—*Cinnaminson, N. J., Sept.* 27, '69.—There is a species of fly (*parasitic*) that is attacking the Tomato-worm in our vicinity in immense numbers. As many as forty or fifty of their cocoons may be seen fastened to the body of a single worm. The cocoons are about the size of a grain of wheat, and attached by their ends. [*Migrocaster cocoons.*—Ed.] They appear to exhaust the vitality of the worm very much, some of them being entirely dried up, while others are so weakened that I doubt if they ever pass through their transformations. These worms are very destructive and nearly ruin our tomato patches. But now they may be seen by hundreds and thousands covered with these white cocoons. The fly is doing its work more effectually than a person could do it, for one-half the worms cannot be found, owing to the resemblance they bear to the plant; but the fly appears to have hunted them all out, comparatively few having escaped.

Chas. Parry.

The Gooseberry Span-worm attacks the Black Currant—*Credit, C. W., Nov.* 5, '69.—On page 13 of your current volume, it is stated as a remarkable fact that the three different Currant and Gooseberry-worms, all of them attack almost indiscriminately the Red Currant and the Gooseberry, while they are none of them ever found upon our cultivated Black Currant, or so far as is known, upon our wild Black Currant. In 1868 my Black Currant bushes were rather badly attacked by the Span-worm larvæ (*Ellopia ribeariæ*, Fitch), but the Saw-fly larvæ did not touch them. I noticed this fact in the *Canada Farmer* of July 1, '68. These Span-worm larvæ have been very injurious to the Buffalo or Sweet-flowering Currant (*R. aureum*) in this neighborhood during the last few years. Numbers of these bushes were entirely denuded of their foliage. They too were exempt from the attacks of the Saw-fly, though it ravaged Red and White Currant and Gooseberry bushes just alongside. I may mention that I have often found larvæ of the Span-worm upon *wild* Gooseberry and Currant bushes in the woods, without however noticing the particular species of Gooseberry or Currant. C. J. S. Bethune.

Grape-berry Moth—*Shiloh, Ills., Sept.* 29, 1869.—The Grape-berry worm is more numerous than ever. I have heretofore been in the habit of permitting my grapes to remain on the vines, until they had attained their utmost maturity; but I find that with this practice many of the worms escape, whilst if I gathered my grapes two weeks sooner, I should get most of the worms into the wine-press, and prevent them from propagating. As it is, I have the berries that drop off the bunches picked from the ground with a great deal of labor, but find it impossible to have them all secured. I apprehend too, that when I commence my late vintage many worms have already left the berries to change to pupæ. An earlier vintage will give me an inferior wine, but a much larger quantity, and will enable me to destroy most of the worms. Adolph Engelmann.

Polyphemus Moth—*Vineland, N. J., Aug. 25th*, 1869.—The last week in July a fine large larva of the *Polyphemus* moth wound up, and on the 14th day of August a splendid moth came forth from the cocoon. It fed and wound up in the open air, and only the day before it came out I cut the twig to which the cocoon was attached and brought it in, thinking that the pupa would remain as usual until next summer, before its final development.

Mrs. Mary Treat.

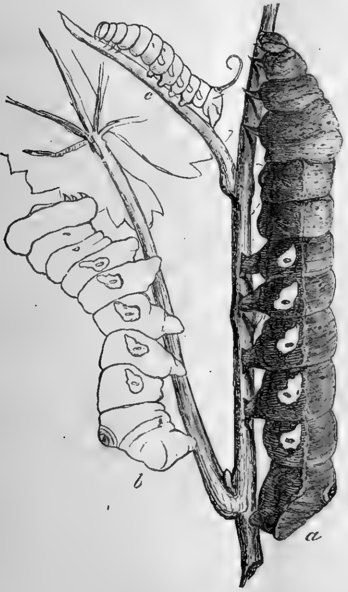
INSECTS INJURIOUS TO THE GRAPE-VINE—No. 4.

The Satellite Sphinx.

(*Philampelus satellitia*, Linn.*)

Like the Achemon Sphinx, figured and described in our last number, this insect occurs in almost every State in the Union. It also bears a strong resemblance to the former species, and likewise feeds upon the *Ampelopsis* as well as upon the Grape-vine; but the worm may readily be distinguished by having five cream-colored spots each side, instead of six, and by the spots themselves being less scolloped.

[Fig. 58.]



Colors—(*a* and *b*) cream-color and reddish-brown; (*c*) pale-green and pink.

In the latitude of St. Louis, this worm is found full grown throughout the month of September, and a few specimens may even be found as late as the last of October. The eggs of this species, as of all other Hawk-moths (*Sphinx* family) known to us, are glued singly to the leaf of the plant which is to furnish the future worm with food. When first hatched, and for some time afterwards, the larva is green, with a tinge of pink along the sides, and with an immensely long straight pink horn at the tail. This horn soon begins to shorten, and finally curls round like a dog's tail, as at Figure 58 *c*. As the worm grows older it changes to a reddish-brown, and by the third moult it entirely loses the caudal horn.

When full grown, it measures nearly four inches in length, and when crawling appears as at Figure 58 *a*. It crawls by a series of sudden jerks, and will often fling its head savagely from side to side when alarmed. Dr. Morris* describes the mature larva as being green, with six side patches; but though we have happened across many specimens of this worm during the last seven years, we never once found one that was green after the third moult; nor do we believe that there are ever any more than five full-sized yellow spots each side, even in the young individuals. The specimen from which our figure was made, occurred in 1867, at Hermann, Missouri, in Mr. George Husmann's vineyard. The back was pinkish, inclining to flesh-color; the sides gradually became darker and darker, and the five patches on segments 6—10 inclusive, were cream-yellow with a black annulation, and shaped as in our figure. On segments 2, 3, 4, 5 and 6, were numerous small black dots, but on each of the following five segments there were but two such dots. A pale longitudinal line ran above the yellow patches, and the head and first joint were uniformly dull reddish-brown.

The most common general color of the full grown worm is a rich velvety vinous-brown. When at rest, it draws back the fore part of the body, and retracts the head and first two joints into the third (see Fig. 58 *b*), and in this motionless position it no doubt manages to escape from the clutches of many a hungry insectivorous bird. Dr. Morris, copying perhaps after Harris, erroneously states that the three anterior joints, together with the head, are retracted into the *fourth*, and Mr. J. A. Lintner† makes the same false assertion. It is the *third* segment in this species, as well as in the Achemon Sphinx, which is so much swollen, and into which the head and first two segments are retracted.

When about to transform, the larva of our Satellite Sphinx enters a short distance into the ground, and soon works off its caterpillar-skin and becomes a chrysalis of a deep chestnut-

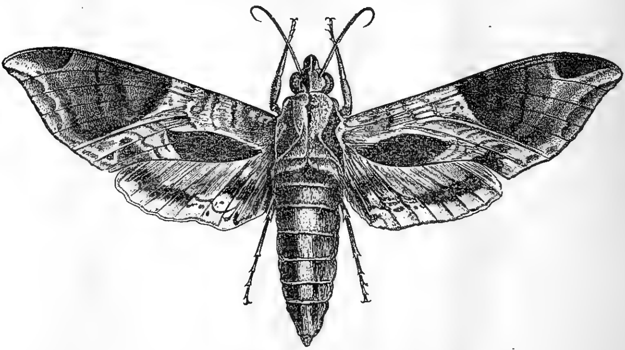
*The synonyms for this insect are *Sphinx lycaon*, Cramer; *Pholus lycaon*, Huebner, and *Daphni pandorus*, Huebner. We adopt Harris's nomenclature for reasons already given in a former number. Mr. A. Grote (Proc. Ent. Soc Phil., I, p. 60), believes that the *Sphinx lycaon* of the authors above quoted, is distinct from *S. satellitia*, Linn., and would fain "*eliminate*" a third species (*posticatus*). For reasons which it would be tedious to give here, we prefer to regard *lycaon* as a variety of *satellitia*.

* Synopsis of N. A. *Lepidoptera*, p. 177.

† Proc. Ent. Soc. Phil., III., p. 659.

brown, and very much of the same form as that of the Achemon Sphinx, figured in our last number. The moth (Fig. 59) makes its appearance in June of the following year, though it has been known to issue the same year that it had

[Fig. 59]



Colors—Light olive-gray and dark olive-green.

existed as larva. In this last event, it doubtless becomes barren, like others under similar circumstances, as was shown in our last number (p. 55). The colors of the moth are light olive-gray, variegated as in the figure with dark olive-green. The worms are easily subdued by hand-picking.

SOUTHERN NOTES.

BY J. PARISH STELLE, SAVANNAH, TENN.

Clothes-Moths.—We have several species of clothes-moths at the South, some of which work all through the winter as far up as Corinth, Miss. They are all troublesome enough, but the individual most to be dreaded is of a light buff color (*Tinea vestianella*,* Steph.), though we have another almost as bad (*Tinea tapetzella*, Linn.), that is nearly black, with the tips of its larger wings white, or pale gray.

These moths generally lay their eggs on the woolen or fur articles they intend to destroy; and when the larva appears it begins to eat immediately, making sad work in a very short time. With the hairs or wool it has gnawed off, it forms a silken case or tube, under the protection of which it devours the substance of the article on which it has fixed its abode. The tube has the appearance of parchment, is open at both ends, but furnished with kind of flaps that the insect can lift at pleasure for the purpose of crawling out; usually, however, it simply projects the front part of its body and crawls about without entirely quitting the case—carrying its house with it.

There are various things recommended as a protection against clothes-moths. One is tobacco sprinkled among the clothes, another is gum-camphor, and still another capsicum or pulverized red pepper. Each of these are good, no doubt, but they are rather objectionable to some on account of their unpleasant effect on the olfactories. I have found alum to be all that is required, without being the least offensive. In case of furs it may be pulverized and sprinkled into them freely; or it may be dissolved in water and the liquid applied. The latter mode is the best for most goods. An article well sprinkled with strong alum water will never be injured by moths.

Soot for Cabbage Worms.—I experimented last summer on the Southern Cabbage-worm (larva of *Pieris protodice*, Boisd.), and found soot to be a very good thing to prevent its ravages. The soot was taken from my chimney, and as I had burned a great deal of yellow pine, it was virtually lamp-black. Having first wetted the cabbage with a fine rose I sifted the soot upon them; and, though it did not keep them entirely clear of worms, owing, I suppose, to the fact that I could not get it on all parts of the plants, I raised a very good crop, while not one of my neighbors matured a single head. The thing is worth trying, and in localities where pine soot cannot be had, I take it that common lamp-black would have the same effect.

A Large Brood.—I "hatched" in Septem-

**rusticella*, Huebner.

ber last, from the cocoons on one tomato worm, (*Sphinx 5-maculata*, Haw.), two hundred and seventy-one small Ichneumon flies! If any person interesting himself in entomology can beat that for a single brood he may take the belt from *me*.

THE SQUASH BUG.—My last summer's experience in this section with the Squash-bug (*Coreus tristis*, De Geer), showed no difference in favor of any variety of squashes. I raised the "White-bush Scallop" and found them to be as hard on it as on any other kind.

The best means that I hit upon of saving my squashes from the pest, was to remove the earth from the roots of the plants as low as it would bear, and fill up with a mixture of dry ashes and salt. Without this precaution I found them going down into the ground on the under side of the vine, and working where I could not get at them.

In addition to the salt and ashes application, I trimmed off all the leaves that touched the ground as soon as they came down, and spread them out under the plants, and upon examination, mornings and evenings, I generally found about all the old bugs nicely housed away beneath the leaves. I think leaves are far better to trap them under than boards or shingles. A decaying or wilting leaf seems to attract them; you will usually find them on such leaves when looking over your vines.

TOADS vs. BUGS.

We make the following extracts from some passages in Fogt's book "On Noxious and Beneficial Animals," which are quoted at full length in the fourth number of *Le Naturaliste Canadien*. For the benefit of the American reader, we translate from the original French.

"A remarkable fact has lately been published in the newspapers. There is actually a considerable commerce in toads between France and England. A toad of good size and in fair condition will fetch a shilling [twenty-five cents] in the London market, and a dozen of extra quality are worth one pound sterling [five dollars]. You may see these imported toads in all the market gardens where the soil is moist, and the owners of those gardens even prepare shelter for them. Many grave persons have shaken their heads, when they heard of this new whim of the English; but those laugh the best who laugh the last. This time the English are in the right. I used to have in my garden a brown toad as big as my fist. In the evening he would crawl out of his hiding place and travel over a bed in the garden. I kept careful watch over him; but one day an unlucky woman caught sight of him and killed him with a single stroke of her spade, thinking that she had done a very fine thing. He had not been dead many weeks, before the snails ate up all the mignonette that formerly perfumed everything round that bed.

* * * * * *

"Toads become accustomed to man, and do not appear to be incapable of tender sentiments. Everybody has heard the story, which seems borrowed from some old popular legend, of a toad which for thirty years lived under an espalier tree, and came out every evening, when the family was taking supper, to get his share of the meal like the dogs and the cats. The family shed tears on the day when an accident deprived that devoted servant of life. Some of my friends believe that, after having heaped benefits upon a toad, they have obtained from that despised animal evident proofs of gratitude. A certain Capt. Perry has told me that, in traveling through the interior of Sicily, he once found on the road a snake that was just about to devour a toad. He killed the snake, and the toad went his way. Six days afterwards he returned by the same road. All of a sudden something hops along close behind him. It was his toad, who had adopted this mode of expressing his gratitude towards his preserver, and who had positively recognized him. 'But, Captain,' I said to him, 'how could you possibly identify the particular toad whose life you had saved? One toad is as like another toad as one egg is like another egg.' 'That is very true,' replied the Captain, 'but he looked at me with such grateful eyes, that I could not doubt his identity for a moment.'"

THE TOMATO-WORM AGAIN.

By way of specimen brick, we print here one of the many ridiculous paragraphs about this poor slandered and vilified Tomato-worm, with which the newspapers always abound at a certain time of the year. The accuracy of its Natural History is only excelled by the accuracy of its English Grammar. It will be noticed that in the last sentence there is a stray nominative case, "a tomato," looking about in vain for some verb with which it can agree. We scarcely know which to pity most, the nominative case or the Tomato-worm. And then think of that most absurd assertion, that the Tomato-worm—which has been well known to Entomologists for about half a century—"was first discovered this season!!!"

THE TOMATO-WORM.—Dr. Fuller, at the corner of Fayette and Montgomery streets, has in his office a Tomato-worm measuring about five inches in length, and weighing about an ounce. It was taken from a tomato vine in his garden, and is now securely enclosed in a glass bottle. It eats and digests daily about twenty times its own weight of tomatoes and tomato leaves. It eats constantly, except resting occasionally from one to two minutes at a time. *This worm was first discovered this season, and is as poisonous as the bite of a rattlesnake.* It poisons by throwing spittle, which it can throw from one to two feet. This spittle striking the skin, the parts commence at once to swell, and in a few hours death ends the agonies of the patient. Three cases of death in consequence of this poison have recently been reported. The medical profession is much excited over this new enemy to human existence. It is advisable for persons picking tomatoes to wear gloves. The question arises whether or not a tomato partly devoured by one of these vermin, and then afterwards eaten by a person, there may not be sufficient virus left upon it to poison the one who eats it? —*Syracuse Standard.*

The question arises, whether or not, in a paragraph such as this, written by a silly ignoramus and published by a sensationist Editor, there may not be sufficient nonsense still undiscovered, to drive fifteen thousand fools crazy?

PARIS GREEN POISONOUS.

[From a Letter from Dr. C. HERING, Philad.]

"In dusting vegetation with Paris Green, in order to destroy noxious insects, the greatest care ought to be taken that the wind may not carry it towards the person of the operator. The arsenite of copper is one of the slow but more dangerous poisons. Many people have been poisoned by sleeping in rooms papered with green paper; and this was caused by the very same stuff. It may even injure the soil, if used repeatedly. Small doses of arsenic alone have rather promoted the growth of rye; but arsenite of copper is much more virulent in its effects, and other cereals or crops may be essentially injured by it."

We may add here, that a very thin dusting indeed with Paris Green, mixed with flour in order to reduce its strength, is sufficient to produce the desired effect upon the obnoxious insects. If used too freely, it becomes injurious to vegetation. "Some of our potato vines and egg-plants," says Prof. A. J. Cook of the Michigan Agricultural College, "have been totally ruined by a too free use of Paris Green. We used one part of the mineral to five parts of flour."

MR. WALSH'S SUCCESSOR.

There is perhaps no more forcible exemplification of Mr. Walsh's individuality of character, than the fact that it is difficult to find the proper person to fill his place. We are so far interested in this matter that we desire to see some competent person—some one who shall be a credit to the State of Illinois, appointed to fill the vacancy. Mr. Walsh had drawn two years' salary ($4,000), i. e., he had received pay to June 11th, 1869. He had, however, issued but one Report, and the Law requires an Annual Report to be published. Why he did not publish a second Report when it was due, we cannot very well say; but perhaps he did not understand the true reading of the Law. For about four months during the spring and summer of 1869 he was quite sick, and too much prostrated to do anything; but he was in excellent health and excellent spirits for two or three months previous to the accident which caused his death. He had just got ready to go to work on his second Report, and his last letter to us was principally occupied with an enumeration of the insects he intended to treat of, and of the illustrations that would be needed. The most vigilant search amongst his manuscripts and papers, has failed to reveal anything written for this Report; but we know, both from correspondence and conversation with him, that he intended to add to this second Report a fully illustrated edition of his first, which was issued as Acting State Entomologist—the two to form one large handsome volume, with about three thousand dollars' worth of steel-plate illustrations.

We recently had the pleasure of calling on Governor Palmer, at Springfield, in company with representatives of the Executive Committee of the Illinois State Horticultural Society. They all seemed to be of the opinion that the best course to pursue would be to defer appointing a successor till the next biennial session of the Legislature, in the winter of 1870–71. But meanwhile to commission some person to carry out Mr. Walsh's intentions, as far as it is possible with our knowledge of them, by publishing a Report on the Entomology of Illinois. If the proper steps are taken, a work on the noxious and beneficial insects of Illinois, equal in usefulness and popularity to "Harris's Injurious Insects," might be prepared by the end of the year 1870. Our idea would be to republish his first Report with full illustrations, and with such additions and corrections as would be found necessary, and to add to it a second

Report. The two might be prefaced with a memoir of his life, accompanied by a steel portrait, and an appendix of such of his correspondence with noted men, as would be found pertinent, might be added at the end. With the proper editorial management and assistance, such a work would not only prove a lasting monument to Mr. Walsh's name, but it would be a credit to the State, and a great boon to the cultivators of the soil for all time to come!

TO OUR SUBSCRIBERS.

The death of our associate will necessitate some change in the character of this journal. Instead of the thought and experience of two individuals we shall strive to freight it with a diversity of opinion, and to this end we solicit communications from our numerous readers, both scientific and practical. We have already, in closing the first volume, announced our intention to pay liberally for all communications that we publish. We make this change in the character of the AMERICAN ENTOMOLOGIST the more willingly, that we deem it a great fallacy to suppose, that because an individual becomes an editor, he therefore constitutes himself a dictator of opinion. We gave this journal a national name for the very reason that we wished it to bear a national character. It is devoted to the Entomology of the whole country and not merely to that of the particular locality where the editor resides.

By studying to counteract the injuries caused by noxious insects; by illustrating the ever interesting phases of insect life, and by close attention to scientific accuracy, we hope to make it invaluable and indispensable, first, to the practical farmer, fruit-grower or gardener, who is seeking for relief from the scourge of insect pests which injuriously affect his crops; secondly, to the popular student of natural science, and lastly, to the purely scientific man.

The publishers will spare no means to make the paper attractive in appearance, and the editor can safely promise to spare no labor to make its contents interesting and instructive. Let the readers but put forth a little effort to properly support it by inducing their neighbors to subscribe, and they themselves shall reap the benefit. We already have the promise of contributions from many able writers on Entomology, and in this connection we would remind our practical readers, that they should not defer sending for publication the results of their experience and observation, because they are not able to rattle off the scientific names of the insects they write about. We shall always be glad to determine the particular species which accompany communications, and to make any other suggestions that may be found necessary.

THE WALSH ENTOMOLOGICAL COLLECTION.

Mr. Walsh's last will was executed about two years ago, and though in this will he dwells minutely and expressively on almost everything that could possibly be made to cause trouble to Mrs. Walsh—even to stipulating that no funeral outlay should be incurred beyond that necessary to decent burial—yet no disposition whatever is made of his Entomological Collection. His wife is made sole executrix of his affairs, and the disposal of the cabinet consequently rests with her. For our own sake, and for the sake of the numerous scientific friends of the deceased, who in future years would like to refer to this collection, either in person or through us, we were naturally anxious to secure the cabinet. We were conscious, however, that the State of Illinois had some claim to it, and knew furthermore that it was Mr. Walsh's strict intention to prepare for that State a duplicate collection from it. We therefore, in our efforts to obtain it, besides making a cash offer, pledged ourselves so far to carry out Mr. Walsh's intentions as to prepare this duplicate collection for the State of Illinois. Whether or not we secure the collection, will depend on whether Mr. Wm. B. Pettit, who now has charge of Mrs. Walsh's affairs, receives a higher bid than ours; for we understand that it is to be sold to the highest bidder. We should not grieve if Louis Agassiz procured it, because it would then fall into the hands of Dr. Hagen, who was one of our associate's dearest friends, and who is moreover well able to appreciate, take care, and make proper use of it. Nor should we greatly lament if it fell into the hands of Mr. E. T. Cresson, of Philadelphia, Pa., for there it would also be appreciated, and be of service to the world. But we are averse to its going East at all, for the reason that Mr. Walsh was essentially a Western man, and was well aware himself of the difficulties under which the student of Natural History labored in the Western States, for the lack of just such collections to refer to. The State of Illinois can certainly afford to pay Mr. Pettit as large a sum as can any individual or any society, and we confidently expect, and sincerely hope that the Governor will see that it is secured. We would also counsel Mr. Pettit not to act rashly in disposing of it to other parties, because it is stipulated in the law, that the State Entomologist shall prapare a collection of the insects of the State to be deposited in the Museum of the Industrial University at Champaign. Action in this matter should not long be deferred by the State, for without the attention of some one who understands taking care of such a collection, it will soon be rendered valueless by fungoid growths, mites, *Dermestes*, and other museum pests.

There are probably eight or ten thousand species in the collection—most of them duplicated. They are mounted on the short English pins, for Mr. Walsh hated the very sight of, and never would adopt our modern Entomological pins, which he termed "German skewers." The specimens are all well dried, however, and remarkably well set. Let us hope that they will fall into such hands that they shall be preserved for centuries to come, and redound to the honor and credit of him who toiled so arduously and yet so willingly to collect them—that long after we have followed their first owner, and have entered the Portals of Eternity with him, these insects may remain a lasting monument to his name, and that they may never become lost to the world, as have those of Thomas Say, and already some of those of T. W. Harris!

A STATE ENTOMOLOGIST FOR MINNESOTA.

We are pleased to learn that at the late meeting of the Minnesota State Horticultural Society in Rochester, Minn., resolutions were passed earnestly recommending the Legislature to provide for the appointment of a State Entomologist. We hope their recommendations will be heeded, and that other States will soon follow the good example. Every State in the Union is cursed with some noxious insects peculiarly its own, and the greater the number of workers in the field, the more quickly shall we become masters of the situation. It is really surprising that in a great agricultural country like ours, subject to such serious insect depredations, so few of the States have appropriated the pittance necessary to the prosecution of proper Entomological studies!

☞ We have to thank our numerous friends for their kind letters of condolence and sympathy in the loss of our associate. The many words of encouragement received will do much to lighten the task that falls upon us.

☞ Now is the time for all those whose subscriptions expire with the first of the year, to renew. Those who appreciate our efforts should strive to send along with their own, the name of some one or other of their neighbors. The effort costs nothing, and besides that satisfaction which every right-minded man feels in imparting to others useful knowledge, there is the reward which comes of having careful neighbors who fight their own insect enemies, and thus make it easier for you to subdue yours.

☞ There is yet a vast and unexplored field for the Entomologist in the South. Our Southern brethren suffer from some of the most grievous inset foes, and their insect fauna is rich and diversified. We consequently take pleasure in announcing, that Mr. J. Parish Stelle, of Savannah, Tenn., is at work in the field, and will continue to send us the "Southern Notes" which he has commenced in this number.

☞ As the insect world is now, for the most part, wrapt in its hyperborian slumber, there are not very many questions for the "Answers to Correspondents" department; and as those questions which we have on hand do not require immediate attention, we defer answering them till next month, in order to make room for other matter.

☞ 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.

☞ Remember, that every one who sends us five subscribers to the AMERICAN ENTOMOLOGIST, is entitled to an extra copy free of charge!

LOCUSTS IN INDIA.

The recent foreign mails bring information that a cloud of locusts of incredible volume has lighted upon the fairest portion of the western provinces of India, which were previously depended upon to make up for the recent famine, and restore plenty to dependent millions. Rice advanced twenty-five per cent. on the appearance of this plague, while a gloom has settled upon the country in anticipation of the destruction of all vegetation wherever they might alight. It is hoped that these destroyers may be speedily destroyed themselves by the wind that sometimes carries them into the sea, or the calamity must reach a fearful height, and tax all the resources of the government to mitigate it.—*Hearth and Home.*

ON OUR TABLE.

Dr. J. T. C. Ratzeburg's great works on "Forest Trees, their Diseases and Insect Enemies," and his work on "Weeds of Germany and Switzerland"—*Die Waldverderbniss* (23 Thaler, gold); *Die Standortsgewœchse und Unkrœuter Deutschlands und der Schweitz* (4½ Thaler); and *Die Waldverderber und Ihre Feinde* (4 Thaler).—Some time since we received from L. Agassiz, through Dr. Hagen, of Cambridge, the foregoing splendid German works for inspection and notice. These works have not their equal in the English language, and with their superb illustrations and vast fund of most desirable information, they should have a place in the library of every college where the German language is taught. We would especially call the attention of the presidents of our different agricultural colleges to these works. The price of the three will probably cost over $40.00 in America; but, in order to introduce them into this country, the author has offered, through his booksellers, to make a liberal deduction when more than one set is ordered, and Dr. H. Hagen, of Cambridge, Mass., has consented to receive subscriptions. The books were accompanied with the following notice from the pen of the last named gentleman, which we gladly make room for, as it contains valuable suggestions, and we have ourselves only found time to hastily glance over the works:

Wood, and forests which produce wood, form almost as important a part of the natural wealth of a country as do metals, coal, and other minerals. In some views wood is even the more important article, since *without wood no culture is possible or imaginable.* Wood cannot in *all* cases be replaced by iron or other bodies. Hence, we find that the regions which are entirely or in part destitute of wood never attain to a cultivated condition (large tracts of Africa, Asia, etc.), while, on the other hand, a superabundance of forests forms an impediment to cultivation, as in many parts of America. It is only after the removal of this excess that cultivation progresses rapidly. Where nature offers riches in great abundance, there the due standard of appreciation becomes lost; and any one who has seen how the Mississippi steamers, as well as the railroads in the East and West, are often fed with timber that is valuable for all purposes, will admit that this is an abuse, or, in other words, that expensive materials are thus wasted. Every waste, however, brings its consequence, and in time necessitates a supply at high rates. There can be no doubt that in a country densely covered with pristine woods, the clearing must precede cultivation, and this clearing has to be carried on in the most rapid and most destructive manner, in order to prove profitable for the moment. But then, afterwards a period is sure to arrive when a stop has to be put to that devastation, in order to forestall want. There can be no doubt that, in America, that time has come, or has even been transgressed, though the fact has not yet become very palpable, for the reason that from other parts, which are still well timbered, plenty of wood can as yet be temporarily imported. A cessation of this destructive practice is to be anticipated from an increasing cheapness of coal as fuel for manufactories, railroads, and steamboats; but this cessation will come too late, in part, and generations to come will be sensibly affected thereby; for it is a well known and very important fact that the same kind of timber that existed on a tract once cleared, cannot be immediately produced again. Nature has managed it so that quite a number of processes of vegetation have to be gone through with before the original trees of the primeval forest can resume their rights. Under the tropics, as well as in high northern latitudes, this change is wrought in the course of a few generations, but in the intermediate temperate zones a much longer time is required. Moreover, the species that immediately succeed those which were cut down are always such as furnish inferior wood. In America, which is endowed by nature with a great number of species which afford the best wood for technical purposes, this fact, no doubt, becomes the more important. It appears to me that the very excellence of American wood has essentially contributed to the rapid advancement of civilization. A great number of skilled pursuits are thereby essentially favored, since the firmness and durability of its material admit of a delicacy and care in their elaboration which, in Europe, is rendered impracticable through the imperfection of their wood.

Add to this another circumstance—one which makes this discussion suitable for the purposes of an entomological paper:

So long as nature alone is operating, it very rarely (or perhaps never) occurs, that extensive damage to plants and trees is wrought by insects or other animals. It is only after the natural relations are altered by human agencies, as, *e. g.*, by the burning down or clearing of entire tracts, or by a subsequent compulsory forest-culture, that noxious insects are multiplied in excess, and require the energetic attention and interference of mankind. We have lately had abundant proof of this in Germany. The well-known Pine Bombyx (*Bombyx Monacha*) had been harmless for about fifty years, when, in 1852, it reappeared. For three years little attention was paid to it, and interference was not attempted until it had become too late. The result can only now, after the termination of the calamity, be fully estimated. From the Ural mountains through the entire width of Russia and Poland, and onward into the interior of Prussia, 175,000 square miles were, in those years, infested, and 55,000,000 cords of wood destroyed. In East Prussia alone (of the size of the State of Massachusetts) 7,000,000 cords. I was myself an eye-witness to interminable trains of butterflies on their way in search of new breeding-places. In several cases they passed over sounds of fifteen miles' breadth in search of intact forests.

I believe that, in America, there exists no independent literature on this subject, and no observations are on record. But it is quite plain that the experience of other countries can be made available. The climate of Europe is, in many respects, very similar to that of the most richly wooded northerly States of the Union. The trees belong to the same genus, and several of the species are exceedingly similar to European ones. It is, hence, quite probable that many of the insects injurious to our forests are also quite nearly allied to those of Europe. In Europe, there are the excellent works of Professor Ratzeburg, who, in his capacity of superintendent of a foresters' university, has conducted his observations with untiring energy for forty years. His latest works contain his experience in a condensed form. In the "Waldverderbniss," etc., may be found all that the celebrated author has elicited concerning the growth and damage done to our trees through the agency of insects and other animals. Numerous woodcuts in the text, and sixty-one plates of excellent execution, adorn this work. It is highly interesting to see, in the figured portions of the forest, how the injury done by insects has changed the entire character of the landscape. The physiological parts, based on microscopical studies, abound in new facts. The healing process that the diseased or injured trees go through, has not only a scientific interest, but also directly concerns the proprietor.

Ratzeburg's works possess the advantage of being almost entirely made up of personal observation, though the author has also considered the contemporaneous and past literature on the subject. Their greatest, and as I think, most important value for America, however, consist in this: that they all put the practical point in the foreground. It is not merely theoretical instruction which is there given, but it is positively money; for it either *saves* or *makes* money.

The sixth edition of his "Waldverderber" (Hurtful Insects: Berlin, 1869. $4.00, gold,) with ten excellent plates, gives, in a popular fashion, a good and instructive account of such animals as interest the farmer, the forester, and the entomologist, and it is the best work of this kind.

Closely connected with the above is an older work of his—"Die Unkraeuter" (The Weeds), treating of one of the most important and interesting subjects for the agriculturist. I will here remark that more than two-thirds of the named weeds cover also the entire north of America, west to the Mississippi, and even farther west.

Ratzeburg's works are, no doubt, of the highest—of the greatest importance. It is my opinion that they ought not to be found missing in the library of any university, school of agriculture, or similar institution. To the observing entomologist, they are positively indispensable, and for such the world-wide celebrity of the author renders every recommendation superfluous.

Annual Report of the Board of Regents of the University of Wisconsin.—From W. W. Daniells, Prof. of Agriculture and Analytical Chemistry.

List of the Nests and Eggs of Birds in the Museum of the Boston Society of Natural History.

The American Sunday School Worker.—A new monthly journal, just started by J. W. McIntyre, of St. Louis, Mo.

Iowa Agricultural Report for 1868.—From J. M. Shaffer, Secretary.

The Country Gentleman's Magazine—London, England. Simpkin, Marshall & Co.

ANSWERS TO CORRESPONDENTS.

Information wanted—*M. A. Kendall, Fitzwilliam, N. H.*—1st: The insects seen by you last summer, darting so quickly and noiselessly among the flowers of your lilacs, were, judging from your description, the gigantic Carpenter Bee (*Xylocopa carolina*, Linn.) You will find it figured and described on page 9 of our first volume. If you will send us specimens next year, we can decide positively; otherwise not. 2d: The "waspish looking thing" on the left hand side of our cover, is the ♀ of a long-tailed Ichneumon fly which may be popularly called the Lunate Rhyssa (*Rhyssa lunator*, Fabr.) It is one of the largest of our Ichneumon flies, and attacks certain wood-boring larvæ, and especially those of the Pigeon Tremex (*Tremex columba*, Linn.), which infest our elms and sycamores. By means of its long ovipositor this large Ichneumon fly is enabled to reach the wood-borer in its hidden retreat, and to deposit an egg in its body. The larva hatching from this egg eventually destroys the original wood-borer. 3d: The odd looking insect at the right of our cover, is the ♂ of the common Stick-bug (*Spectrum femoratum*, Say), a vegetable-feeder of sluggish movements. It receives its popular name from the remarkable habit which it has of stretching forward its two front legs and its antennæ, in the manner represented in that figure. It often remains a long time motionless in this position, so that it in reality looks very much like a dead stick growing from the tree or shrub upon which it happens to be. Its scientific name refers to the immensely swollen middle thighs of the ♂. For a fuller account of this singular insect, see Vol. I, p. 58.

Insects named—*Jos. E. Chase, Holyoke, Mass.*—No. 1, *Tetropium cinnamopterum*, Kirby. Nos. 2 and 3, varieties of No. 1. No. 4, *Boros unicolor*, Say. No. 5, *Saprinus pennsylvanicus*, Payk. No. 6, *Tenbrio molitor*, Linn. No. 7, *Philonthus blandis*, Grav. No. 8, *Haltica nana*, Say. No. 9, *Harpalus* ———? No. 10, *Colastus unicolor*, Say. No. 11. *Brachys ovata*, Lec. No. 12, *Prionus imbricornis* (small dimorphous form). No. 13, *Photinus neglectus*, Lec. No. 14. *Bryacantha* 10-*pustulata*, Melsh. No. 15, *Haltica* (*Phyllotreta*) *striolata*, Illig. No. 16, *Noda parvula*, Dej. = ? ovata, Say. No. 17, *Chalcophana convexa*, Say. No. 18, *Pediacus subglaber*, Lec. No. 19, *Aphrastus tæniatus*, Say. No. 20, *Calligrapha multipunctata*, Say. No. 21, *Clytus leucoyonus*, L. and G. No. 22, *Listroderes*. No. 23, *Galcophana picipes*, Oliv. No. 24, *Galeruca haunatica*, Lec. No. 25, *Saprinus assimilis*, Er. No. 26, *Hpdrocharis obtusatus*, Say. No. 27, *Colymbetes biguttalus*, Say. No. 28, *Hydrophilus glaber*, Hbst. No. 29, *Berosus fraternus*, Lec. No. 30, *Podabrus rugulosus*, Lec. We are indebted to Dr. Geo. H. Horn of Philadelphia, for the proper determination of several of the above named insects.

Disease in Wheat—*A. L. Child, M. D.*—We regret to say that the ears of wheat which you sent last summer, were retained so long in the publishers' office that nothing could be made of them when they were handed to us. In writing upon business matters always address the publishers, but in writing on editorial matters, or in sending specimens, you should as invariably address the editor.

THE

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VOL. 2. ST. LOUIS, MO., FEBRUARY, 1870. NO. 4.

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CHARLES V. RILEY, EDITOR.

THE CECROPIA MOTH.

(*Attacus Cecropia*, Linn.)

We cannot recall a single insect which has been so often sent to us for determination as the Cecropia Moth. It is so conspicuous, whether in the larva, chrysalis or moth state, that it readily attracts attention. The moth (Fig. 59) is really a most elegant insect, and in our mind is second only in splendor to that of the Royal Horned-caterpillar, which forms the frontispiece to our first volume. The ground-color of the wings is a grizzled dusky brown with the hinder margins clay-yellow; near the middle of each of the wings there is an opaque kidney-shaped white spot, shaded more or less on the outside with dull red, and edged with black; a wavy dull red band edged inside with white, crosses each of the wings, and the front wings next to the shoulders are dull red with a curved white and black band, and have near their tips an eye-like black spot with a bluish-white crescent; the upper side of the body and legs are dull red; the forepart of the thorax, and the hinder edges of the rings of the abdomen are white, and the belly is checkered with red and white. There is considerable variation in the ground-color of individuals, some being quite dark and others quite light, but the female differs from the male in nothing but her larger abdomen and much smaller antennæ or feelers.

[Fig. 59.]

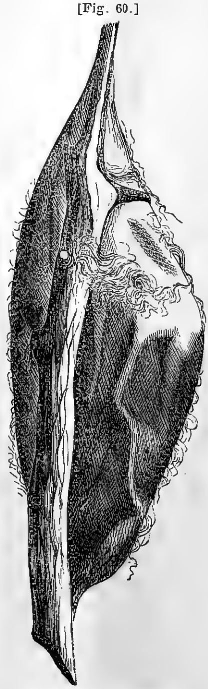
Colors—Grizzled dusky brown, dull red, and white.

This insect belongs to the same family (*Bomby-*

cidæ) as the well-known Silk-worm, and is, in fact, one of our very best native American Silk-worms. The genus *Attacus*—meaning elegant—was founded by Linnæus, and our moth received its specific name from the same author. As *Cecropia* was the ancient name of the city of Athens, and as it has puzzled some naturalists to divine why Linnæus applied this name to our moth, we give the following explanation by Dr. Fitch: "The great legislator of this department of human knowledge, as he is expressively styled by Latreille, it has been frequently remarked, was endowed with a genius that few of his disciples have inherited, for selecting names for natural objects, which are most appropriate and happy. The idea which was present in the mind of Linnæus, when he named this splendid moth, we think is sufficiently evident. The Athenians were the most polished and refined people of antiquity. The moths are the most delicate and elegant of insects; they are the Athenians of their race. Cecrops was the founder, the head of the Athenian people. When the names of men were bestowed upon cities, ships or other objects regarded as being of the feminine gender, classical usage changed these names to the feminine form. The moths (Phalæna) being feminine, and the name of Cecrops being more euphonious in this form, probably induced Linnæus to change it in the manner he did. The name thus implies this to be the leader, the head of the most elegant tribe of insects, or in other words, the first of all the insect kind. What name more appropriate can be invented for this sumptuous moth?"

In regard to the generic name, we may as well state, that the genus *Attacus* has been badly cut up by modern systematists, as indeed have most of the old Linnæan genera. In botany it seems to have become the fashion to combine, and thus lessen the number of genera, and as this course greatly facilitates study, in the great majority of instances, it were devoutly to be wished that our entomologists would emulate the example of their botanical friends. But it seems to have been the rage among certain entomologists to split up the old genera, until, as in the present case, generic differences have been based on what no one, who was not more anxious to further his own name than the true interests of science, would consider other than specific. The German Entomologist Hübner, in 1816, separated the genus *Attacus* into several genera, of which his *Samia* includes our Cecropia Moth. After him, an English Entomologist, Duncan, constructed the genus *Hyalophora*, to receive certain large moths with glassy spots in their wings (the word meaning literally "glass-bearer"), and had the carelessness to refer our Cecropia Moth, which has no such glassy spots, to this new genus of his. More recently, Mr. A. R. Grote has erected the genus *Platysamia*, which separates our *Cecropia* Moth from that of the Arrhindy Silk-worm (*A. Cynthia*) to which Hübner's original genus *Samia* is restricted. Yet it seems to us that no one but the most inveterate "genus-grinder" would ever think of separating two insects which have so many points of resemblance. But as our views on this subject are very fully expressed in the article on "Scientific Nomenclature" in the first number of the present volume of the AMERICAN ENTOMOLOGIST, we will not weary the reader with this rather unprofitable subject. Opinions will differ, and every man will be properly judged by posterity for the opinions which he held while living; and it is only necessary to state that in order to simplify the arrangement, we have followed Harris's example, in using the older and more commonly known generic names.

[Fig. 60.]



Color—Yellowish-brown.

During the winter time, the large cocoons of this insect (Fig. 60) may be found attached to the twigs of a variety of different shrubs and trees. We have ourselves found them upon Apple, Cherry, Currant, Barberry, Hazel, Plum, Hickory, Blackberry, Elderberry, Elder, Elm, Lilac, Red-root, Maple, Willow and Honey-locust. This cocoon tapers both ways, and is invariably fastened longitudinally to the twig; it is formed of two distinct layers, the outer one, which is loose, wrinkled, and resembles strong brown paper, covering an inner oval cocoon composed of the same kind of silk, but closely woven like that of the common Silk-worm. Inside this cocoon will be found the large brown chrysalis (Fig. 61). The cocoon of the large Polyphemus Moth (see AMERICAN ENTOMOLOGIST, Volume I, No. 7), which has

[Fig. 61.]

Color—Light brown.

been called by Mr. L. Trouvelot, of Medford, Massachusetts, the "American Silk-worm," is rounded, and the silk is very closely and compactly woven: and though that of our Cecropia is not as valuable for utilitarian purposes, yet we have not a doubt but it will some day be propagated for the silk which it produces; and though it may not lay claim to the national title of THE American Silk-worm, it will nevertheless rank as second best, among those which are indigenous to this country.

The following are some of Mr. Trouvelot's reasons, as communicated to us, for preferring Polyphemus to Cecropia: 1st. The silk fibre spun by the latter is not so strong nor so glossy as that of the former. 2ndly. The cocoon of the latter being double, pointed, and open at one end, makes it unfit to reel, as the water of the bath in filling the cocoon would sink it to the bottom, a very unfavorable circumstance, since it would cause the fibres of the different cocoons to entangle and break every moment. 3rdly. The larva of Cecropia is a very delicate worm to raise, it does not suffer handling, and when once feeding on a given species of plant, it does not readily bear changing to another, or even to a variety of the same plant. 4thly. It has the misfortune to be more generally attacked by birds and parasites, four-fifths of them being thus sacrificed, in a state of nature. We entirely concur in the first two reasons given, though until the silk of Polyphemus has been more successfully reeled off than heretofore, the second objection loses much of its force, since our own experiments would indicate that they both have to be carded. As to the last two objections, though they undoubtedly apply in Massachusetts, where Mr. Trouvelot made his experiments, they will not hold true in the West; for we have always been more successful with indoor broods of Cecropia than of Polyphemus, and with us the latter is fully as much subject to parasites as the former, as might have been inferred from its comparative scarcity.

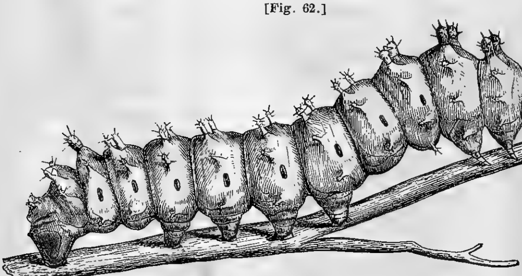
In the month of May, in the latitude of St. Louis, and earlier or later the farther north or south we go, our Cecropia Moth issues from its cocoon, and there can be no more beautiful sight imagined, than one of these gigantic fresh-born moths with all its parts soft and resplendent. The uninitiated would marvel how such an immense creature had escaped from the small cocoon which remains at its side, retaining the same form which it always had, and showing no hole through which the moth could escape. The operation—so interesting and instructive—can be witnessed by any one who will take the trouble to collect a few of the cocoons and place them in some receptacle which has sufficiently rough sides to admit of the moth's crawling up, to hang its heavy body and wings while they dry and expand. The caterpillar has the wonderful foresight to spin the upper or anterior end of its cocoon very loosely, and when the moth is about to issue it is still further aided in its efforts by a fluid secreted during the last few days of the chrysalis state, and which is a dissolvent of the gum which so firmly unites the fibres of the cocoon.* This fluid is secreted from two glands, which open into the mouth, and as soon as the chrysalis skin is split open on the back, by the restless movements of the moth within, the fluid flows from the mouth and wets the end of the cocoon, dissolving the gum, and softening the silk to such an extent, that by repeated contractions and extensions of the body, the moth is at last enabled to separate the fibres, and to thrust out its head and unbend its front legs; after which it rapidly draws out the rest of its body, the mouth of the cocoon afterwards closing, by the natural elasticity of the silk. At this moment the body of the moth is much swollen and elongated, the wings are small, folded, and pad-like, and the whole insect is soft and moist; but attaching itself to the first object at hand, where it can hang its heavy body and clumsy wings, the latter become expanded in about twenty minutes, and the superabundant fluids of the body sufficiently evaporate in a few hours to enable the insect to take wing.

The eggs of the Cecropia Moth are 0.09 inch long, sub-oval, flattened, and of a pale cream-color, shaded with light brown, and they are deposited in small patches on the plants which are to form the food of the future larvæ. They

*In the *Practical Entomologist*, Vol. II, p. 55, Mr. Walsh saw fit to deny the well-established fact of the use of this fluid by Silk-worm moths and especially by our Cecropia, styling the statement as the nonsense of closet-naturalists. Of course it requires no great astuteness to perceive that such a fact could be proved just as well by a closet-naturalist as by any other, and though we do not know that Mr. Walsh ever expressed any change of opinion in print, yet we confidently believe that he would have done so upon the first occasion that presented; for he finally became entirely convinced that such a fluid is secreted, and freely acknowledged his former error, as he was always ready to do in such cases.

are deposited in June, and hatch in from six to ten days after being deposited. The young worms differ so much from the mature ones, and undergo such great changes in appearance in the course of their lives, that we are surprised that no account is to be found of these larval changes in any of our entomological works. When first hatched they are entirely black, with the tubercles placed in the same position, but being larger at the base and with a narrower stem than in the more mature individuals, the upper and smaller end being crowned with a whorl of conspicuous stiff black bristles. After the first moult the body is of a deep orange color, with the tubercles and head black, and with longitudinal rows of black dots running between them. After the second moult, a still greater change takes place: the body acquires a beautiful yellowish-green tint, the tubercles on the back are blue on sequents 1, 12 and 13; coral-red on 2 and 3, and yellow with black spines and a black spot on the inside and outside of the stem, on 4—11. Those at the sides are blue, and the head is of the same color as body. After the third moult, the black spots, except a row below the stigmatal row of tubercles, disappear; the tubercles themselves lose all black except the spines, and the head and body become delicate bluish-green rather than yellowish-green as formerly. After the fourth and last moult, the red tubercles near the head frequently become yellow, and when full-grown, the worm measures over four inches, and presents the appearance of Figure 62, the tubercles being respectively of the most delicate yellow and blue. Two weeks after the worm first began to spin, it changes to a chrysalis, and as already stated, passes the winter in this form, there being but one brood each year.

[Fig. 62.]



Colors—Green, blue, yellow, and red.

On the 20th of March, 1867, Mr. J. A. Jackson, of Gooding's Grove, Ills., brought to us a cocoon from which the moth had not yet escaped. Enclosed in the cocoon with the chrysalis was a kernel of corn, and Mr. Jackson was anxious to know how it got there. The only explanation we could give, was that the kernel had perhaps been accidentally dropped by some bird, and had fallen through the meshes of the loose silk and lodged while the worm was yet spinning its cocoon. It is one of those singular coincidences which occur once in a life-time, and we mention it in this connection, simply to place the fact on record.

Parasites of the Cecropia Moth.

Last year our Cecropia worm seemed to be unusually numerous in many parts of the country, but it very rarely becomes sufficiently so to prove greatly destructive; though instances are on record of their having entirely stripped small apple trees. The principal reason is

[Fig. 63.]

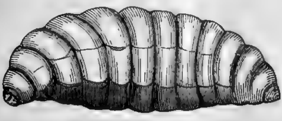
Color—Yellowish-brown.

because they are such large and conspicuous objects, that they fall a ready prey to birds, and to numerous insect enemies. We will conclude this article by referring to a few of the more conspicuous of the latter.

THE LONG-TAILED OPHION—(*Ophion macrurum*, Linn.) — This large yellowish-brown Ichneumon fly (Fig. 63) is often bred from the cocoons in place of the moth which one expects. It is one of the most common parasites of this large insect, and the females appear to be altogether more common than the males, for we have bred no less than seven of the former and not a single one of the latter sex. The female, according to Mr. Trouvelot, deposits from eight to ten eggs upon the skin of her victim, and the young larvæ soon hatch from them and commence to prey upon the fatty parts of the worm. But as only one of the parasitic larvæ can find food sufficient to mature, the rest all die from hunger, or else are devoured by the strongest one which survives them. At first one would suppose that this deposition of several eggs by the parent Ichneumon, where only a single larva can develop, is a striking instance of misdirected instinct; but we find a similar prodigality throughout Nature, for every individual is so subject to disasters of one kind or another in its struggle for existence, that a provision of several ova is often necessary to insure the future development of a single one, just as we often sow several seeds of some particular plant, in order to insure the growth of a single one.

After the Cecropia worm has formed its cocoon, the parasitic larva, which had hitherto fed on the fatty portions of its victim, now attacks the vital parts, and when nothing but the empty skin of the worm is left, spins its own cocoon, which is oblong-oval, dark brown inclining to bronze, and spun so closely and compactly, that the inner layers when separated have the appearance of gold-beater's skin. If we cut open one of these cocoons soon after it is completed, we shall find inside a large fat legless grub (Fig. 64), which sometimes under-

[Fig. 64.]

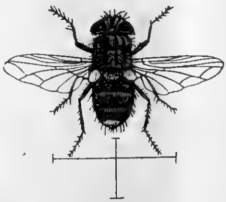


Color—Yellowish.

goes its transformations and issues as a fly in the fall, but more generally waits till the following spring.

THE CECROPIA TACHINA FLY.—The Ichneumon fly last mentioned usually causes a dwarfed appearance of the worm which it infests, and parasitized cocoons can generally be distinguished from healthy ones by their smaller size. The larvæ of the Tachina fly, which we now introduce to our readers, as parasitic on the Cecropia worm, seem to produce an exactly opposite effect—namely, an undue and unnatural growth of their victim. In the beginning of September, 1866, we received from Rockford, Ills., an enormous Cecropia worm. It measured over four inches, was a full inch in diameter, and weighed nearly two ounces; but like many other large specimens which we have since seen, it was covered with small oval opaque white egg-shells, clusters of four or five occurring on the back of each segment, invariably deposited in a transverse direction. The skin of the worm was black where the young parasites had hatched and penetrated. This large worm soon died and rotted, and in about twelve days a host of maggots gnawed their way through the putrid skin. These maggots averaged about one-half inch in length, and in form were like those of the common Blow-fly. The head was attenuated and retractile and furnished with two minute curved hooks, and the last segment was squarely cut off, slightly concave and with the usual two spiracles or breathing-holes which this class of larvæ have at their tails. Their color was of a translucent yellow, and they looked very much like little pieces of raw fat beef. They went into the ground and remained in the larva state all winter, contracted to pupæ in the April following, and the flies commenced to issue the last of May. This fly is the *Exorista cecropia* of our MS., or Cecropia Tachina Fly, but as it differs from the Red-tailed Tachina Fly (*Exorista militaris*, Walsh, Fig. 65), which similarly infests the Army-worm, in no other respect than in either lacking the red tail entirely, or in having only the faintest trace of it; and as in a lot of the *militaris* bred last summer from Army-worms, we find considerable difference in this respect, we prefer, rather than multiply species on such mutable grounds, to consider it as a variety of that species. We infer that this same Tachina fly attacks the Cecropia worm in widely different parts of the country; for we have this winter received from Mrs. Mary Treat, of New Jersey, two dipterous pupæ which probably belong to this species, and which had also in the larva state infested a Cecropia worm.

[Fig. 65.]



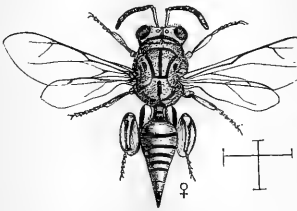
Colors—Gray and black.

THE CECROPIA CHALCIS FLY—(*Chalcis maria*, N. Sp.*)—In May, 1869, we received from Mr.

**Chalcis maria*, N. Sp.—♀ yellow, beautifully marked with black. *Head*, yellow with an arcuate black mark behind base of the antennæ, connected with a fine short longitudinal black line leading to lower ocellus, and from thence to posterior margin of occiput which is margined with black; prothorax with a medium black dot. *Antennæ* (scape ⋊ 9 joints) 10-jointed; scape fulvous with superior edge black, flagellum dark brown or black. *Thorax* with large shallow close-set punctures; mesothorax somewhat striated transversely, trilinear with black, the three lines

V. T. Chambers, of Covington, Ky., numerous specimens of the hitherto undescribed beautiful large Chalcis fly figured herewith (Fig 66),

[Fig. 66.]



Colors—Black and yellow.

which he had taken from the cocoon of the Polyphemus moth, which is quite common, and issues as early as the middle of February in that locality. He says, "I was satisfied that the cocoon did not contain a living Polyphemus and therefore opened it. It contained so little besides these insects and their exuviæ, as to suggest strongly the old idea that the caterpillar had been metamorphosed into them (as in a sense it had). There were 47 of them, of which 23 were females. As all the males, and some of the females were dead when I opened the cocoon, I think it likely that the former never do emerge, and perhaps but few of the latter; otherwise Polyphemus would soon be exterminated."

We can very well imagine that most of these Chalcis flies would die in their efforts to escape from the tough cocoon of the Polyphemus, but it so happens that these same parasites have been found by Mrs. Mary Treat, of Vineland, New Jersey, to prey upon the Cecropia worm, from the cocoon of which they can much more easily escape. We take pleasure, therefore, in naming this pretty Chalcis fly in honor of that lady. The same fly also attacks the Promethea worm—another of our large native Silk-worms —and Mrs. Treat has had a similar experience with Mr. Chambers, of finding them dead in its cocoon. She has upon two occasions found cocoons with a dead Chalcis fly fast in the hole which it had eaten to make its escape; and upon cutting open such cocoons they were found literally packed with dead Chalcis flies. It would seem that they all make their escape through the hole made by some one of their number, and that if this particular one fails in the undertaking, they all perish rather than make holes for themselves.

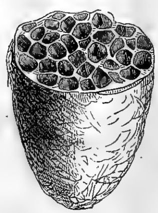
connected by a transverse line which separates the prothorax from mesothorax, the middle line straight, the outer ones deeply impressed, approaching behind and connected on the posterior margin by a short transverse line, and then suddenly diverging on lateral suture of scutellum; a longitudinal black dot on each side over tegulæ; scutellum edged anteriorly with black and with a central longitudinal black line; basal margin of metathorax, with a spot on each extreme side and a large subtriangular mark on disk, black; pleuræ with two black lines on each side. *Wings* hyaline. *Abdomen* yellow with sometimes a faint tinge of green, black at base and tip, and each segment banded with black superiorly; petiole yellow, black at tip above. *Legs* yellow, the tarsi inclining to fulvous; a broad line on posterior coxæ above, and interior edge of femora and of tibiæ, and tip of femora, black; the femora about as large as abdomen with over 12 minute black spines on inferior edge. Average length 0.20 inch.

♂ differs in the less pointed abdomen, and somewhat longer petiole, in the scape of antennæ not being black superiorly and being much more robust; in the flagellum being of the same color as scape, and in the coxæ having a black line both above and beneath. Average length 0.15. Described from 10♂ 4 ♀ bred from *Attacus polyphemus* and 2 ♂ 1 ♀ bred from *A. promethea*. Variable in size, some ♂♂ being much larger than some ♀♀.

Say's *amœna*, bred from a *Thecla*, in which no sexual difference is mentioned, somewhat resembles the ♀ of this species, but differs from it principally in having the thorax quadrilinear with black, the petiole black, the pleura black, with four yellow spots, and in the thighs having six or eight *prominent* spines, the superior one divided into three or four.

THE DIVORCED CRYPTUS—(*Cryptus nuncius*, Say; *extrematis*, Cresson).—Another Ichneumon fly infests the Cecropia worm in great numbers, filling its cocoon so full of their own thin parchment-like cocoons, that a transverse section (Fig. 67) bears considerable resemblance to a honey-comb. The flies issue in June, and the sexes differ sufficiently to have given rise to two species. We have bred 7 ♀ and 29 ♂ from a cocoon of the Cecropia moth, and 6 ♀ from one of the Promethea moth, all the males agreeing with the species described by Say as *nuncius*,* and all the females agreeing with that described afterwards as *extrematis* by Mr. Cresson.

[Fig. 67.]



*Say does not mention whether his description was taken from a ♂ or ♀.

THE SPARROWS.

The London *Builder* says: "One hundred and eighteen Sparrows have been offered upon the altars of science. The contents of the stomachs of the victims have been examined, tabulated and recorded. Three culprits alone, out of this hecatomb, were proved by the unsparing search, guilty of having lived for the past four-and-twenty hours upon grain. In fact, there were three thieves out of the 118; all the other victims had worked, more or less, for their living. Beetles and grubs, and larvæ of all obnoxious kinds had been their diet. In 75 of the birds, infants of all ages, from the callow fledgling to the little Pecksy and Flapsy that just twitter along the ground, hardly any but insect remains were detected."

GALLS AND THEIR ARCHITECTS—2d ARTICLE.

[CONTINUED FROM PAGE SEVENTY-FOUR.]

Galls Made by Beetles.

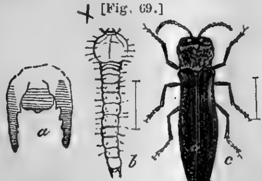
(Order, *Coleoptera*, Families *Buprestis*, *Curculio*, etc.)

THE RASPBERRY GOUTY GALL—(*Rubi podagra*, new species.)—In the spring of the year, when Raspberry and Blackberry patches are being overhauled and pruned, many of the canes will often be noticed to swell out in particular places, (like a limb infested by the gout,) for the length of an inch or so, as shown in Figure 68. Instead of being smooth and of a uniform color, like the healthy parts, the swelled part of the cane, which is a true gall, always splits up longitudinally into a great many short, rough, brownish slits, and on inspecting these gouty galls more carefully, numerous little ridges will be observed, the general direction of which is round and round the axis of the cane. If the observer takes his knife and cuts into the ridges just now described, he will find under each of them the passage-way of a minute borer, filled with the brown excrement which he has left behind him; and either in these passage-ways or in the pith of the cane he will often detect the insidious little borer himself. (Fig. 69, *b*.) This borer is a small, thread-like larva, of a creamy white color, with the front part of its body much flattened out horizontally, as in the common Hammer-headed Borer of the

[Fig. 68.]

Colors—That of the cane, with brown scales.

[Fig. 69.]



Colors—(*a*) brown; (*b*) whitish; (*c*) coppery-red and black.

Apple-tree, the head being small and retractile, with the jaws of a brown color, and the tail being furnished with two long, slender, blunt-pointed, dark brown thorns or horns. When full-grown it ranges in size from one-half to three-quarters of an inch. Like most other borers, this one in the earlier stages of his larval life burrows exclusively in the sapwood, thereby very generally—owing to the spiral course which he adopts—girdling and killing the cane that he inhabits. The same cane often contains several of them; and in that event the shape of the gall which they produce often becomes very irregular. Towards the end of April in South Illinois, but probably rather later in more northerly latitudes, the larva penetrates into the pith, so as to be more secure from his insect foes, and there transforms into the pupa state; and early in the summer, and sometimes even as late as the fore part of July, the perfect beetle emerges to the light of day. Although we do not know, by direct observations, at what particular time in the preceding year the Raspberry Gouty-galls originate, yet as the beetles come out in June and July, we may infer by analogy that the sexes then immediately couple, and that the female shortly afterwards deposits her eggs in or on the young canes, whence in the course of the same summer there must necessarily hatch out the tiny young larvæ that are the architects of these galls.

This beetle belongs to the same group (*Buprestis* family) as the well-known Hammer-headed Apple-tree borer, (*Chrysobothris femorata*), and another species which is peculiarly attached to the Cherry, (*Dicerca divaricata*). Indeed all the species of this extensive and beautiful group burrow in the wood of different trees, each having its peculiar vegetable favorites; and some of the largest, which in the beetle state considerably exceed one inch in length and are gloriously resplendent with burnished copper and gold, are in the larva state most grievous pests among our Pines and Firs. The genus to which our Raspberry Borer belongs (*Agrilus*) differs from most of the other genera comprised in this Family by being of a very slender elongate shape, and by containing no species but such as are of quite a diminutive size, the largest of them being less than half an inch in length. Our species was originally described in the year 1801 by the German entomologist Fabricius, under the name of the Red-necked Buprestis (*Agrilus ruficollis*), in allusion to the brilliant coppery color of its head and thorax, (see Fig. 69, *c*); but—as very generally happens in such cases—this author was entirely ignorant of its larval history. At length in 1846, that excellent entomologist, Prof. S. S. Haldeman, published to the world the fact of its destroying the stalk of the Antwerp Raspberry, illustrating his Article on the subject by figures;* though, so far as we can find out, it does not appear that he was acquainted with the galls that it forms, or, at all events, that he considered the swellings produced by it as being what they undoubtedly are—true, genuine, unmistakable galls. Finally in 1869, through the kind assistance of Mr. J. B. Miller, of Anna, in South Illinois, who forwarded to us in the April of that year a bountiful supply of these galls, we were enabled to trace the species through all its transformations, and to complete its larval history as a true gall-maker. The following remarks by this gentleman on its habits, under date of April 30th, 1869, will, we are sure, be highly appreciated by the horticultural world:

These borers infest the Philadelphia and Doolittle Raspberry and the Wilson Blackberry, but they are seldom found in the High-bush or Rigid-cane varieties. Their habit, as it seems, is to girdle the cane in the previous season, in order to kill it. If they succeed in this, they are all right; otherwise, they appear to freeze out and die during the winter, perhaps owing to the superabundance of sap which then surrounds them. In Blackberry canes this misfortune befalls them much more frequently than in Raspberry canes. I have heard many complaints during the last winter about the Doolittle Raspberries winter-killing; but I suspect that in reality it is this little borer, and not the cold weather, that has killed them. In fact all of mine that have perished, have perished entirely through this cause.

I fear that this fellow will become in time pretty troublesome here, if raspberry-growers do not take the proper means to get rid of him. My own plan is to cut the infested canes out and burn them, before the perfect insect emerges from the pith; for it is there, as you will readily perceive, that he retires to pass into the pupa state, most of them, as I observe, having transformed into that state during the last two weeks in April.

Nothing can be more scientifically correct, and, we may add, more practically important, than these last observations of Mr. Miller's, as to the best method of fighting this destructive little pest. From our own observations, we incline to believe that the Red-necked Buprestis is much more likely to trouble the Raspberry and Blackberry growers in southern than in northern latitudes. About eight years ago we noticed a very large number of their galls in our own Raspberry patch at Rock Island, in North Illinois. But although we gathered great quantities of them about the last of March, when we were pruning and thinning out the canes, and although we took the proper means for breeding the beetle therefrom, we did not succeed in rearing a single specimen to maturity; neither could we ever discover in succeeding years a single gall in this very same Raspberry patch, which contained about three or four dozen hills. Hence we draw the conclusion that, in ordinary seasons, the winters of North Illinois are destructive to the species.

We may add that our Raspberries belonged to two distinct varieties of the imported European species (*Rubus Idæus*), to which also appertains the Antwerp Raspberry which Prof. Haldeman found to be infested by the Red-necked Buprestis. On the other hand, Mr. Miller obtained his galls from the Doolittle and Philadelphia Raspberries, which are cultivated varieties of our wild Blackcap Raspberry (*R. occidentalis*), and some of them from the Wilson Blackberry, which is, we believe, a mere variety of the Common or High Blackberry (*R. villosus*). Thus it results that the same indigenous gall-making beetle attacks almost indiscriminately three distinct species of the same botanical genus (*Rubus*); one of which, the Common Garden Raspberry, is an imported plant, while the other two, namely the Blackcap Raspberry and the Common Blackberry, are native American citizens. For although in common parlance we speak of the Raspberry and Blackberry as distinct genera, all botanists agree in classifying them under one and the same genus.

The Grape-vine Wound-gall.

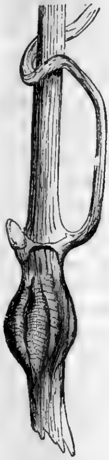
(*Vitis vulnus.*)

In our former article on "Galls and their Architects," we described and figured two new galls on the Grape-vine, both of which are produced by Gall-gnats. The gall which we are now going to talk about is generated, not by a Gall-gnat, but by a Snout-beetle, and was described by us for the first time, but without assigning any name to it, in the Missouri Agricultural Report for 1868 (pages 131-2). It first becomes visible upon the young canes, and more especially upon those of the Concord variety, towards the latter end of July, the Snout-beetle which produces it generally coming out in the fore part of that month. At first it is, as usual with galls, small and inconspicuous; but towards the end of the season it assumes the appearance of an elongated knot or swelling, which is for the most part situated immediately above or below a joint (Fig. 70, *a*). Almost invariably there is a longitudinal slit or depression on one side, dividing that side into two checks, which generally have a rosy tint. Inside the

Quarterly Journal of Science and Agriculture, 1846; see also a paragraph by the same author in the *Farm Journal*, Vol. I. p. 193.

gall resides the larva of the gall-maker—a little, footless, white, cylindrical grub, with a large yellowish head and tawny jaws. When full-grown in the spring of the following year, this larva measures 0.28 of an inch in length, and very much resembles that of the Potato Stalk-weevil, which we figured in Volume I, No. 2 (Fig. 12, *a*). During the latter part of June it transforms within the gall to a pupa, which also very much resembles that of the Potato Stalk-weevil, differing principally in the wings and legs reaching down to ⅘ths the length of the body instead of but ½ as in that species. About two weeks afterwards it changes into the Sesostris Snout-beetle (*Baridius Sesostris*, Le Conte), of which we present a sketch in Figure 71.* This beetle is of a uniform yellowish-brown color, without any markings whatever; and it differs from most Snout-beetles by being highly polished, and especially by the peculiar glassy undulating appearance of the wing-cases.

[Fig. 70.]



Color—Green.

We think it highly probable that this Grape-vine Wound-gall is caused, more by the punctures which the female beetle makes in depositing her egg, and by the drop of poison, which from analogy we may infer that she instils from her abdomen into the puncture along with the egg, than by the irritating gnawings of the larva. For frequently, in the one-year-old cane, we have noticed that the larva had burrowed two or three inches away from its original home in the gall, without its having caused a corresponding swelling in the part of the cane where we met with it. So far as we have observed, the Grape-wound Gall does not cause the death of the cane upon which it grows, nor to any material extent injure the vine upon which it grows. Should such an event ever happen, or should these galls increase to any considerable extent, so as to become formidable to the Vine-grower, their further multiplication may be readily checked by cutting off and burning the infested canes at any time before the Snout-beetle leaves them in the forepart of the following July.

[Fig. 71.]

Colors—Shiny yellowish-brown.

We have noticed in September, upon the leaf-stems of the common Virginia Creeper (*Ampelopsis quinquefolia*), generally close to the leaf itself, a simple swelling opening externally with a large ragged discolored mouth. This is a true gall, and it is produced by what Dr. Le Conte considers as an undescribed species of the very same genus of Snout-beetles (*Madarus*), to which we had ourselves originally referred the Sesostris Snout-beetle. This Virginia Creeper Snout-beetle (*Madarus ampelopsidos*, new species) is met with inside the gall in September, and it scarcely differs, so far as we can discover, from the Sesostris Snout-beetle, except in being a trifle more robust, and of a uniform shining coal-black color, instead of yellowish-brown. As the Virginia Creeper belongs to the same botanical Family as the Grape-vine, this, with us, was an additional argument for referring both these gall-producing insects to the same genus (*Madarus*), as we have done in the Missouri Entomological Report. For it is a very general rule that the same genus of gall-makers inhabits the same genus of plants, or at all events confines itself to such genera of plants as are very closely allied together. Still, as Dr. Le Conte has decided to classify the two insects under two different, but closely allied genera (*Madarus* and *Baridius*), we have, in deference to his deservedly high authority, adopted his nomenclature.

*As regards the correct nomenclature of this beetle, it is allowed on all hands that up to December, 1868, the species was undescribed. In March, 1869, the Junior Editor described it, in the Missouri Agricultural Report as quoted above, under the name of "*Madarus vitis*," and gave nearly the same account of its larval and pupal history as has been already presented to our readers. In December, 1868, or three months before the Junior Editor published his Report, Dr. John L. LeConte, in a Paper "On the species of *Baridius* inhabiting the United States," published in *Proc. Acad. Nat. Sc. Phil.*, described it (page 364) under the name of "*Baridius Sesostris*." Consequently, Dr. LeConte's specific name necessarily takes precedence of the Junior Editor's.

In the paper on *Baridius* just now referred to, it is stated that *B. Sesostris* "depredates on grape-vine, producing the gall described by Mr. Walsh as *Vitiscunnus*." Now, the Senior Editor recollects having sent specimens of the beetle to Dr. LeConte in the summer of 1868, with an account of the gall that it generates; and in his private correspondence with that gentleman he may possibly have given some name or other, no matter what, to the gall itself. He distinctly remembers, however, being soon afterwards favored by Dr. LeConte with a sight of the Manuscript of the Paper on *Baridius*, then nearly ready for publication; and he can testify upon oath to his having erased in pencil the "*Vitiscunnus*" that appeared there, and substituted for that name the one which we have adopted in this Article, namely "*Vitis vulnus*." In any case, no negative fact can be better established, than that the Senior Editor never described in print this gall under any name whatever, as is erroneously, and we doubt not unintentionally, asserted by the author of the Paper "on U. S. *Baridius*." Consequently, as the Junior Editor did not give any scientific name to this gall in his Official Report, and as a mere mention by Dr. LeConte of any particular scientific name—erroneously supposed by him to have been given to this gall by the Senior Editor along with a proper scientific description—amounts, according to scientific etiquette, to just nothing at all; the name which we now for the first time give it, being authenticated by a full description, must take precedence of any other.

As to the generic name of this Snout-beetle, we acknowledge that we still have our doubts whether it be properly referable to *Baridius* rather than to *Madarus*; but since Dr. LeConte is confessedly the King of the Coleoptera in this country, we yield at once to his authority in this matter.

The curious reader will perhaps ask, why Dr. LeConte gave to this Grape-vine gall-maker the name of "the Sesostris Snout-beetle" (*Baridius Sesostris*). Sesostris was an ancient Egyptian king, who lived three or four thousand years ago. What can he possibly have to do with a gall on an American grape-vine? Now, it so happens that Dr. LeConte refers us to a passage in Herodotus,* for the origin of this name "Sesostris." After a long and tedious search, we succeeded at length in finding a copy of this most amusing old historian in the original Greek; and we find that he tells us that Sesostris subdued the whole world ages and ages ago—that, whenever he had fought against a brave nation and conquered them, he set up a marble obelisk with a short inscription stating that Sesostris had subdued such and such a people, and that they were brave men—and finally that, whenever he met with a nation that was too cowardly to fight against him, he set up another marble obelisk, with the corresponding inscription, that Sesostris had subdued such and such a people, but that they were effeminate and unmanly cowards. "And," adds the gossiping old Greek, "in the latter case he always sculptured at the end of the inscription an emblematic symbol (*αἰδοῖα γυναικὸς*), to stigmatize in the most significant and expressive manner their effeminate unmanliness."

As Herodotus informs us that Sesostris subdued the whole world, may it not be possible that the great Egyptian conqueror reached North America with his victorious arms by way of China and Kamschatka? And that this peculiarly North American Grape-wound Gall is a precious fragment of the ancient inscription, which he set up in this country thousands and thousands of years ago? *Quien sabe?* Who knows?

*Book 2nd, chapter 102.

REPORT OF THE COMMITTEE ON ENTOMOLOGY.

READ BY THE EDITOR BEFORE THE MISSOURI STATE HORTICULTURAL SOCIETY.

In the preparation of my Annual Report, I have dwelt in detail on many insects that have attracted attention during the year, either by their injuries or benefits. In that report numerous illustrations will be used to appeal to the eye of the reader, and as it will be published in the same volume with your transactions, I deem it superfluous at the present time to dwell on the natural history of any one insect. Permit me, therefore, to cursorily refer to a few of the prominent entomological events of the year, and afterwards to make a few generalizations, which it is hoped will prove of some little interest and value.

The year 1869 may be set down as one in which our crops, as a general thing, have suffered less than usual from insect depredations. At least such has been the case in Missouri, and, judging from extensive correspondence, the same statement would hold true of most of the northern and middle States of the Union.

True, the army worm (*Leucania unipuncta*, Haw.), and the Grain Plant-louse (*Aphis avenæ*, Fabr.), appeared in many parts of the State in sufficient force to do considerable damage, and these two insects may always be expected in a tolerably wet year that was preceded by a very dry one. But most insects, and especially those which afflict you as horticulturists, have behaved exceedingly well, though it is difficult to say whether we are to attribute this good behavior on their part, to the increased knowledge of their habits which has been disseminated among those who have to deal with them, or to the more potent and unalterable workings of Nature.

The Chinch Bug, which in the dry summer of 1868, committed such ravages upon our grain crops in many portions of the State, and especially in the southwest, was scarcely heard of in 1869, after the copious rains which characterized the past summer commenced to shower down. The Apple Worm, or Codling Moth has been altogether less injurious than it was the year before, and in Adair, Buchanan, Cooper, Callaway, Cass, Lewis and Polk counties, especially, and probably all over the State, our orchards have been loaded with fair fruit. This result was predicted by the writer, and may be attributed principally to the scarcity of the insect, resulting from the partial failure of the apple crop in 1868; but in some part to the improved methods of fighting the foe. For, as in our civil strifes, we introduce improvements in the machinery which is to slay the opposing armies, so in this progressive age, we believe in introducing machinery to battle with our liliputian insect hosts, whenever it is available. And the experience of the past year proves, that to destroy this insect, old pieces of rumpled rag or carpet placed in the crotch of a tree, are to be preferred to the hay-bands wrapped around it, because it requires altogether less time to place the rags in their place than to fasten the hay-band; and the worms which spin up in them can be killed by wholesale, either by scalding the rags or by pressing them through the wringer of the washing machine.

Owing to the severe drouth of 1868, which was unfavorable to its successful transformations, that dreaded foe of the fruit-grower, the Plum Curculio, was scarce in the early part of the season, and our plum and peach trees set a fuller crop than they had done before for years; but the subsequent moist weather was favorable to the underground evolutions of this little pest, and the new brood appeared in great numbers about the end of June and beginning of July, when they did much damage to stone-fruit and some damage to pip-fruit by the gougings which they made for food. As stated in an essay read before the State meeting of our Illinois horticultural friends, I have discovered a little cannibal in the shape of a minute yellow species of *Thrips*, which destroys vast numbers of the little turk's eggs; and let us hope, that by attacking the Curculio in its most vulnerable point, this *Thrips* may in the course of a few years reduce the numbers of the Curculio, as the ladybirds have done with the Colorado Potato-bug, or as the minute mite (*Acarus mali*) is known to have done with the common Oyster-shell Bark-louse of the Apple. The eggs of the Apple-tree Plant-louse (*Aphis mali*) which last winter so thickly covered the twigs of the apple trees in many orchards, hatched and produced a prodigious number of lice as soon as the buds commenced to burst. In this immediate neighborhood they were soon swept away, however, by their cannibal insect foes, and by insectivorous birds, such as the warblers, etc.; but a physiological fact connected with this insect has been developed this year by Dr. E. S. Hull, the able Illinois State Horticulturist, which is of such importance that I cannot pass it over even in this brief report. He has ascertained that we suffer from the injurious punctures of their little beaks long after the lice themselves have disappeared. In fact, he has proved to his own satisfaction that the so-called "scab" in apples, which prevailed to such an alarming extent last year, and rendered thousands and thousands of bushels valueless for market purposes, is actually caused by the punctures of these lice. I said that the doctor had proved this matter "to his own satisfaction," because I believe that caution requires that we should not consider it as an established fact until all objections to it can be dispelled. Personally I have made no observations on this matter, but the facts in the case all add weight to Dr. Hull's theory, if such it can be called. Hitherto the cause of the "scab" on apples has been involved in mystery. It was supposed to have a fungoid origin; yet an examination will show that the scabby appearance is not caused by any live fungus, but by arrested growth of the cells which have become corky and cicatrized. The importance of this discovery of Dr. Hull's, should it once be firmly established, cannot well be estimated; for when we have once ascertained the cause of a disease, it need scarcely exist any longer. By destroying the lice we shall prevent scabby apples, and experience teaches that they can be destroyed by a good syringing of tobacco water. We may expect, in this immediate vicinity, an almost total exemption from "scab" next year, for the apple trees are remarkably free from the minute black bead-like eggs of the Plant-louse with which they were so thoroughly peppered a year ago.

The Tent Caterpillar (*Clisiocampa Americana*) was more abundant than usual in our orchards, and the Tent Caterpillar of the Forest (*Clisiocampa sylvatica*) also appeared in great numbers both on our orchard and forest trees.

A worm which I have called the Pickle Worm, (*Phacellura nitidalis*, Cram.), and which had never been publicly noticed before, appeared in immense numbers, and did great damage to our cucumbers and melons by boring into the fruit, but as this insect, with others, will be fully treated of in my forthcoming Report, I will pass on to a more general subject.

> "The pebble in the streamlet scant,
> May turn the course of many a river;
> The dew-drop on the infant plant,
> May warp the giant oak forever."

In no department of science does the old proverb "prevention is better than cure," apply with such force as in that of Economic Entomology. In my studies and observations I have often been struck with the fact that many of our very worst insect enemies have been introduced from abroad, and that if this subject of Economic Entomology had been better understood and appreciated fifty years ago, and the proper measures had been taken to prevent the introduction of these pests, we should at present be free from the curse of the great majority of them. We have, indeed, plenty of native American insects, which have become great pests to the cultivator of the soil, on account of the artificial state of things which he induces. In a state of nature, a given species of plant, in its struggle for existence, is scattered promiscuously over a certain extent of country, and the particular insect or insects which feed upon that plant, have to search for it over a comparatively extensive surface, and their multiplication is consequently restricted. But the pursuit of horticulture, for instance—

which may be succinctly defined as the assembling in tracts of greater or less extent, of one species of plant at the expense and exclusion of others—causes the particular insects which feed upon that plant, to multiply unduly, and we have to use that same intelligence in subduing these insects which we employ in producing the artificial results which caused their increase. In the normal state of things insects never increase unduly; but, on the contrary, always act as Nature's most faithful servants, and accomplish a most important work in her economy. Yet, for reasons explained above, they naturally become our enemies, and we should suffer from the depredations of our indigenous species, even though no foreign ones had been imported. But we have altogether more than our share of these insect depredators, and so truly is this the case, that insects which attract universal attention, and are considered as very serious evils in Europe, would not be deemed worthy of notice in this country. There, if they loose one-fifth of a given crop, the whole community becomes alarmed; but here the cultivator sometimes considers himself fortunate if he secures the half of his crop from insect ravages, and each State loses annually from fifty to sixty million dollars from this cause alone, though but four States have as yet made any attempt to prevent this serious loss. In order to bring this fact home to you, and to show why we suffer more than do our foreign brethren, I will read a paper, which I have prepared for the AMERICAN ENTOMOLOGIST upon "Imported Insects and Native American Insects."

[This paper will be found in another part of the present issue.]

The theory advanced in the above paper, may meet with some objectors, although I confidently believe in the inference there stated of the relative advancement and improvement of the flora and fauna of the two continents. But there is another reason why the insects which are imported into this country multiply at a prodigious rate, and soon acquire herculean power of doing harm, though they may never have stepped beyond the limits of propriety in their own native home—a reason too palpable and evident to savor of the theoretical. It is, that whenever an injurious insect is introduced in our midst, as a general rule the particular parasite or parasites which kept it in check abroad, are not introduced with it. In consequence, the foreigners, unaccompanied by the usual *gens d'armes*, throw off all restraint and play the deuce with our crops; just as the rats and mice will take possession of, and overrun a house, if not restrained by human or by feline agencies.

Sometimes, as in the case of the Imported Currant-worm, the noxious insects introduced from the old world are attacked by native American parasites, but as I believe the parasites of European nativity to be, as a rule, more energetic and vigorous than our indigenous ones, it would be advisable even in such a case, to import in addition such species as prey upon it in Europe. But in the case of the Wheat Midge which has actually flourished among us for almost half a century without a single parasite of any kind whatever infesting it from one end of the country to the other, it is sheer folly and culpable shiftlessness not to import among us from the other side of the Atlantic some one or all of the three different *Chalcis* flies which are known to check it throughout all Europe. And so with other insects which are known to be unaccompanied with the parasites which attack them abroad. Years and years ago Dr. Fitch demonstrated in print the policy of such a step; but bugs and bug-hunters are so very generally the subject of festive ridicule among the high and the low vulgar, that hitherto the recommendation of the State Entomologist of New York has met with no practical response.

Now no one will fail to understand the force of the old proverb already quoted, after listening to these facts. Let us profit by the experience of the past, and while battling with those foes which are already in our midst, let us keep a watchful eye, and be on our guard ready to crush any new plague that may threaten us, before it gets beyond control. Yes, but 'say you, how is this to be accomplished? Can it be done by the government? Yes, in some cases; as for instance in the importation of parasites, government aid should be solicited. If, in 1860, when the Asparagus Beetle (*Crioceris asparagi*, Linn.) was first introduced on to Long Island, the Legislature of the State of New York had taken proper action in the matter, the insect might have been stamped out of the island at the trivial expense of a few hundred dollars, instead of being allowed to multiply, as it did, to such an extent as to occasion a dead loss of some fifty thousand dollars in a single county, and of spreading from the island into the adjoining country. Quite recently a weevil (*Bruchus granarius*) which does immense damage to peas and beans and some other plants in Europe, was introduced into New York in some pods which a certain gentleman presented to the New York Farmers' Club, and if the proper steps are at once taken, it may yet be prevented from spreading through the country.

In Europe vast sums have been expended in founding professorships of Economic Entomology in the various agricultural colleges, and in conducting elaborate experiments on the best means of checking and controlling these tiny foes. But the entire sum expended by Congress or by our various State Legislatures for this purpose, from the Declaration of Independence to the year of our Lord 1869, cannot exceed ninety or one hundred thousand dollars, or about one thousand dollars a year. Yet the annual damage done by insects within the limits of the United States cannot be less than three hundred million dollars. Indeed, it is but quite recently that the people, from necessity, have awakened to the importance of the subject. We now have an Entomologist connected with the Department of Agriculture at Washington, and, with proper care, he can be of inestimable service to the country, in preventing the introduction of noxious insects. It is not noxious weeds alone, such as the Canada thistle, which are sent broadcast over the land by the distribution of uninspected seeds; but noxious insects are very frequently distributed in the same way. We have the highest authority, Dr. J. L. LeConte, of Philadelphia, for the statement, that before the Entomologist received his appoinment, a noxious beetle, *Rhizopertha pusilla*, which has now become naturalized here, was originally introduced into this country in wheat from the Patent Office.

Therefore, there can be no doubt that much may be done at headquarters. That government aid cannot be of any avail in the great majority of instances, however, is equally apparent to those who have studied this question; and we must trust to a more thorough dissemination of such information as will enable each individual to protect himself. Much is being done in this direction by means of State Reports, through the AMERICAN ENTOMOLOGIST, and through our various agricultural and horticultural journals; but much yet remains to be done. We must bear in mind that by enlightening our neighbors, we are helping ourselves, and, as horticulturists, we should urge that more attention be paid in our colleges, and especially in those of an Industrial nature, to the study of the Natural Sciences.

In my First Report, I have shown how the Oyster-shell Bark-louse, though perfectly able to live in the northern part of this State, is yet unknown there; and I tremble, lest some one in carelessness or ignorance should introduce this dreaded plague of the apple grower into that section, from some Eastern or Northern nursery. Every tree received from a distance should be examined from "top to stern," as the sailors say, before it is planted, and all insects, in whatever state they may be, destroyed. There can be no doubt that many of our worst insect foes may be guarded against by these precautions. The Canker-worm, the different Tussock-moths or Vaporer-moths, the Bark-lice of the Apple and of the Pine, and all other scale insects (*Coccidæ*), the Apple-tree Root-louse, etc., are continually being transported from one place to another, either in earth, on scions, or on the roots, branches, and leaves of young trees; and they are all possessed of such limited powers of locomotion, that unless transported in some such manner, they would scarcely spread a dozen miles in a century.

In the Pacific States fruit-growing is a most profitable business, because they are yet free from many of the fruit insects which so increase our labors here. In the language of our late lamented Walsh, "although in California the Blest, the Chinese immigrants have already erected their joss houses, where they can worship Buddha without fear of interruption, yet no 'Little Turk' has imprinted the crescent symbol of Mahometanism upon the Californian plums and Californian peaches." But how long the Californians will retain this immunity, now that they have such direct communication with infested States, will depend very much on how soon they are warned of their danger. I suggest to our Pacific friends that they had better "take the bull by the horns" and endeavor to retain the vantage ground they now enjoy. I also sincerely hope that the day will soon come when there shall be a sufficient knowledge of this subject throughout the land, to enable the nation to guard against foreign insect plagues; the State against those of other States, and the individual against those of his neighbors.

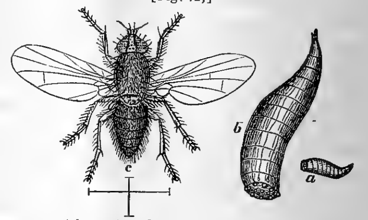
SILK-WORM EGGS.—Two tons of Silk-worm eggs lately passed on the Pacific railroad from California eastward, bound from Japan to France. They left Yokohama, Japan, December 2. In this shipment were 78 packages valued at $800 per package.

IMPORTED INSECTS AND NATIVE AMERICAN INSECTS.

If we examine into the history, as detailed in a recent number of our Magazine, (pp. 15–22) of the Imported Currant Worm and the Native Currant Worm, we shall find a very curious state of things. These two insects both produce Sawflies, which are so closely allied to each other, that although they are referred to distinct genera by Entomologists, it may be doubted whether the genus (*Pristiphora*) under which the native species is classified be not a mere subgenus of that under which the imported species is classified. Reasoning *a priori*, therefore, we should expect to find a very great similarity in the destructive powers of these two worms, especially as each of them infests the leaves both of the Red Currant and of the Gooseberry. But what are the actual facts? On the one hand we see a Native American species—which must have existed here from time immemorial, feeding on our wild Gooseberries and perhaps on our wild Red Currant, and which yet has troubled our tame Gooseberries and tame Red Currants so very slightly, that it cannot be proved with absolute certainty to have ever done so at all, except in Rock Island Co., Ills., and in Scott Co., Iowa.*

On the other hand we see a species, only introduced into this country from Europe some twelve years ago, which has already almost put a stop to the cultivation of the Gooseberry and Red Currant throughout a large part of the State of New York, the northern borders of Pennsylvania, and the whole of Canada West, and is slowly but surely extending itself in all directions from the point where it was originally imported. What can be the reason of such a wide difference in the noxious powers of two such closely allied insects, feeding on exactly the same plants, but one of them indigenous to America and the other imported into America from Europe? Nor is this the only case of the kind. We can point out at least three other such cases. The imported Onion-fly (*Anthomyia ceparum*), of which we herewith present drawings, (Fig. 72, *a*, larva, *b* larva magnified, *c* fly magnified,) is a

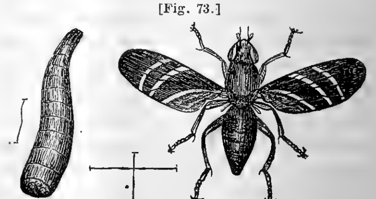
[Fig. 72,]



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

terrible pest to the onion-grower in the East, though it has not yet made its way out West. On the other hand, the Native American Onion-fly (*Ortalis arcuata*, Walker, Fig. 73,) which is a closely allied species and has almost exactly

[Fig. 73.]



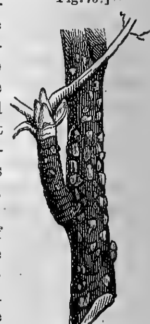
Color—Whitish. Color—Blackish.

the same habits, has only been heard of in one or two circumscribed localities in the West, and even there does comparatively but little damage. Again, the Imported Oyster-shell Bark-louse (*Aspidiotus conchiformis*, Fig. 74) is a far worse foe to the Apple and certain other fruit trees than our indigenous Harris's Bark-louse (*Asp. Harrisii*, Fig. 75) though each of them infests the same species. Finally, the imported Meal-worm beetle (*Tenebrio molitor*) swarms throughout the whole United States, and is a great pest; while the Native American species

[Fig. 74.]

Color—Greenish brown; the eggs under the scale milk-white

Fig. 75.]



Color—Milk-white; the eggs under the scale blood-red.

*In Volume 15th of the *Prairie Farmer*, page 501, a correspondent from Jefferson Co., Iowa, states that as early as June 11th, in the year 1865, "a small green worm had taken the lion's share of his currants and gooseberries" This may possibly refer to the Native Currant Worm, which feeds upon gooseberry and currant leaves, but it more probably means the Gooseberry Fruit-worm (*Pempelia grossulariæ*, Packard,) which feeds upon the gooseberries and currants themselves, and which may be found figured and described in our First Missouri Report, page 140. What a vast fund of information is scientifically unavailable, simply because correspondents are so stingy with their pen, ink and paper. Again the editor of the *Farmers' Union*, published at Minneapolis, Minn., says in a recent number of that paper, that several gardens in that vicinity have been for the past few years infested with the Currant Worm, and that last year they visited his own garden for the second time, having, the previous year, made sad havoc with the foliage before they were discovered. Now, as there are three perfectly distinct worms which attack the leaves of currant bushes, and as the editor contents himself with referring to "THE Currant Worm," the information he imparts is perfectly valueless to the Entomologist, and the practical man may be led astray by the remedies suggested.

(*Tenebrio obscurus*), which has almost exactly the same habits, belongs to the same genus and is of very nearly the same size, shape, and color, is comparatively quite rare among us, and is scarcely known to our millers and flour-dealers.

On a careful and close examination, it will be found that almost all our worst insect foes have been imported among us from the other side of the Atlantic. The Hessian Fly* was imported almost ninety years ago; the Wheat Midge about half as long ago; the Bee Moth at the beginning of the present century; the Codling Moth, the Cabbage Tinea, the Borer of the Red Currant, the Oyster-shell Bark-louse, the Grain Plant-louse, the Cabbage Plant-louse, the Currant Plant-louse, the Apple-tree Plant-louse, the Pear-tree Flea-louse, the Cheese-maggot, the common Meal-worm, the Grain Weevil, the House Fly, the Leaf-beetle of the Elm, the Cockroach, the Croton Bug, and the different Carpet, Clothes and Fur Moths, at periods which cannot be definitely fixed. Even within the last few years the Asparagus-beetle has become naturalized in New York and New Jersey, whence it will no doubt spread gradually westward through the whole United States, while the Rape Butterfly, as shown in our last number, was introduced about a dozen years ago, and is rapidly spreading over some of the Eastern States. And only a year ago the larva of a certain Owlet-moth, (*Hypogymna dispar*), which is a great pest in Europe both to fruit-trees and forest-trees, was accidentally introduced by a Massachusetts entomologist into New England, where it is spreading with great rapidity. It is just the same thing with Plants as with Insects. We have looked carefully through Gray's *Manual of Botany*, and we find that—excluding from consideration all cryptogams, and all doubtful cases, and all cases where the same plant is supposed to be indigenous on both sides of the Atlantic—no less than TWO HUNDRED AND THIRTY-THREE distinct species of plants have been imported among us from the Old World, all of which have now run wild here, and many of which are the worst and most pernicious weeds that we have to contend against. In the U. S. *Agricultural Report* for 1865 (pp. 510–519) will be found a list of 99 of the principal "Weeds of American Agriculture," by the late Dr. Wm. Darlington. Of this whole number no less than 43, or nearly one-half, are species that have been introduced among us from the Old World. Among these we may enumerate here, as the best known and the most pernicious, Butter-cups, (two species,) Shepherds' Purse, St. John's Wort, Cow-cockle, May-weed or Dog-fennel, Ox-eye Daisy, Common Thistle, Canada Thistle, Burdock, Plantain, Mullein, Toad-flax, Bind-weed, Jamestown (Jimson) weed, Lamb's Quarter, Smart-weed, Field Garlic, Fox-tail Grass and the notorious Cheat or Chess. And to these we may add the common Purslane, which through some strange oversight has been omitted in Dr. Darlington's catalogue.

It will be supposed, perhaps, since there are about as many voyages made from America to Europe as from Europe to America, that we have fully reciprocated to our transatlantic brethren the favors which they have conferred upon us, in the way of Noxious Insects and Noxious Weeds. It is no such thing. There are but very few American insects that have become naturalized in Europe, and even these do not appear for the most part to do any serious amount of damage there. For example, on one or two occasions single specimens of our Army-worm Moth (*Leucania unipuncta*) have been captured in England; but the insect has never spread and become ruinously common there, as it continually in particular seasons does in America. Our destructive Pea-bug (*Bruchus pisi*) has also found its way to Europe; but although it is met with in England, and according to Curtis has become naturalized in the warmer departments of France, Kirby and Spence expressly state that it does not occur in England "to any very injurious extent," and Curtis seems to doubt the fact of its being naturalized in England at all.* Again, the only species of White Ant that exists within the limits of the United States, (*Termes frontalis*), has been known for a long time to be a guest at the Plant-houses of Schönbrunn in Germany; but is not recorded to have ever as yet spread into the surrounding country. As to our American meal-worm (*Tenebrio obscurus*), Curtis states that it has been introduced into England along with American flour, and that it is sometimes abundant in London and the provinces;† but Kirby and Spence say not one word about it, and it seems to be confined to the English sea-ports and the places where

*For the sake of the scientific reader, we subjoin here, in their regular order, the scientific names of the Insects catalogued by their English names in the texts of this paragraph:—*Cecidomyia destructor*, *Diplosis tritici*, *Galleria cereana*, *Carpocapsa pomonella*, *Plutella cruciferarum*, *Ægeria tipuliformis*, *Aspidiotus conchiformis*, *Aphis avenæ*. *A. brassicæ*, *A. ribis*, *A. mali*, *Psylla pyri*, *Piophila casei*, *Tenebrio molitor*, *Sitophilus granarius*, *Musca domestica*, *Galeruca calmariensis*, *Blatta orientalis*, *Ectobia germanica*, *Tinea tapetzella*, *vestianella*, *pellionella*, &c.; *Crioceris asparagi*, *Peiris rapæ* and *Hypogymna dispar*.

*Kirby & Spence *Introd.* letter 6th; Curtis *Farm Insects*, p. 358.

†*Farm Insects*, p 334.

American flour is stored, without spreading into the adjacent districts.

A very minute yellow ant, however, (*Myrmica molesta*), which is often very troublesome with us in houses, has, according to Frederick Smith, "become generally distributed and naturalized" in houses in England; and Kirby and Spence state more specifically, that "it has become a great pest in many houses in Brighton, London and Liverpool, in some cases to so great an extent as to cause the occupants to leave them."* As to our Chinch Bug, our Curculio, our Plum Gouger, our two principal Apple-tree Borers, our Canker-worm, our Apple-tree Tent-caterpillar, our Fall Web-worm, our Peach-tree Borer, and our other indigenous pests among the great Army of Bad Bugs, nobody ever yet found a single one of them alive and kicking on the other side of the Atlantic. And with regard to Plants, the only two American plants that we know to have become so firmly established in Europe as to be a nuisance there, are an American aquatic plant, the common Water-weed (*Anacharis canadensis*), which has choked up many of the canals in England, and our common Horse-weed, or Mare's tail as it is called in the West, (*Erigeron canadense*), which has spread from America nearly over the whole world.

Since then, it can be demonstrated by hard dry facts, that American plants and insects do not become naturalized in the Old World with anything like the facility with which the plants and insects of the Old World are every day being naturalized in America, there must be some cause or other for this singular state of things. What is that cause? It is, as we believe, a simple fact which is pretty generally recognized now as true by modern naturalists, namely, that the plants and animals of America belong, as a general rule, to an old-fashioned creation, not so highly improved and developed as the more modernized creation which exists in Europe. In other words, although this is popularly known as the New World, it is in reality a much older world than that which we are accustomed to call the Old World. Consequently, our plants and animals can no more stand their ground against European competitors imported from abroad, than the Red Indian has been able to stand his ground against the White Caucasian Race. On the other hand, if by chance an American plant or an American animal finds its way into Europe, it can, as a general rule, no more stand its ground there against its European competitors, than a colony of Red Indians could stand their ground in England, even if you gave them a whole county of land and an ample supply of stock, tools, and provisions to begin with. For throughout Animated Nature, as has been conclusively shown by Charles Darwin, there is a continual struggle for existence, the stronger and more favorably organized species overpowering and starving out from time to time their less vigorous and less favorably organized competitors. Hence it is as hopeless a task for a poor puny old-fashioned American bug to contend against a strong energetic highly-developed European bug, as it would be for a fleet of old-fashioned wooden ships to fight against a fleet of our modern iron-clads.

*Smith in Stainton's *Entom. Annual* 1862, p. 70, and 1863 pp. 59-62; Kirby & Spence *Introd.*, Letter 8th.

Let not "Young America," however, be altogether discouraged and disgusted at hearing, that our Animal and Vegetable Creation is more old-fashioned than that of what is commonly known as the Old World. The oldest geological formations, in which the remains of Mammals occur, contain the remains of such mammals exclusively (*Marsupialea*) as bring forth their young only partially developed, and carry those young about with them in a pouch, till the day of complete development and physical "second birth" arrives. In America we have a single genus—the Opossums—that belongs to this antediluvian type. In the three ancient continents they have absolutely none at all. But if in this respect America is more old-fashioned than Europe, Australia is still more old-fashioned than America; for there almost all their mammals possess this remarkable peculiarity; so that if the American creation is somewhat old-fogyish, that of Australia is the very concentrated essence of old-fogyism itself. Consequently, if Europe crows over us as altogether "behind the times," "Young America" can take its revenge by crowing over Australia, as the land of the Kangaroo and the Wombat and other such exploded absurdities of the Mesozoic epochs.

☞ Now is the time for all those whose subscriptions expire with the first of this year, to renew. Those who appreciate our efforts should strive to send along with their own, the name of some one or other of their neighbors. The effort costs nothing, and besides that satisfaction which every right-minded man feels in imparting to others useful knowledge, there is the reward which comes of having careful neighbors who fight their own insect enemies, and thus make it easier for you to subdue yours.

BLADDER-PLUMS.

For many years we have noticed in the middle of June on particular trees of our common wild plum (*Prunus americana*), that many specimens of the fruit were enlarged to thrice their usual size and were uneven and wrinkled on their external surface instead of being smooth and plumply rounded. On cutting into such specimens, they are found to be hollow and spongy inside, instead of solid and fleshy; and almost entirely detached from the exterior rind, there lies in the centre the juicy white stone which is found imbedded in the flesh of the normal plum at this season of the year. On the closest examination, we could never detect in these diseased plums any tokens of the operations of insects.

On June 9th, 1868, A. Gilbert, of Tipton, Iowa, sent us two pressed specimens, similar to those which we had ourselves found on the Wild Plum, but gathered from his own plum-orchard. He did not specify what varieties of plum he had in cultivation, but he stated that with him the disease commenced about four years ago, and has now taken almost complete possession of his trees. Hence it would appear that, besides the Curculio, there is still another destructive pest which the unfortunate plum-grower has to guard against. Verily, this work of growing plums seems to be "the pursuit of fruit under difficulties."

We can guarantee that this bladder-like degeneration of the plum is not caused by any insect. What, then, does cause it, if insects do not? We answer that, in all probability, it is caused by a peculiar parasitic fungus, which may, or may not, be identical with one which produces very similar effects in Europe. In the London Periodical called *Science Gossip*, for August 1st, 1869, we notice an observation that Bladder-plums, which are described as being almost exactly like our American ones, are common on the Sloe or Blackthorn (*Prunus spinosa*) in England, and that they are said to be caused by a Parasitic Fungus (*Ascomyces deformans*). The fruit presents none of its ordinary succulent characters, the stone is not formed, and the ovule is more or less atrophied, while sometimes a second carpel is produced. From a recent article on Peach Rot by Dr. T. C. Hilgard of St. Louis, we learn that that gentleman had had such specimens sent him from Europe by the distinguished botanist, Dr. G. Engelmann of St. Louis; and that from their showing "an empty, degenerated and inflated germ;" they were popularly known there as "fools." The tree on which they occurred is said by Dr. Hilgard to be "*Prunus padus*," which Gray describes as a small Bird Cherry, which is occasionally planted in this country, and resembles the Choke Cherry, but has longer and looser, and often drooping racemes, and a roughened stone.

We have on one or two occasions received these "Bladder-plums" from correspondents in Missouri, and Dr. L. D. Morse, and Jno. H. Tice of St. Louis, both have found them on the wild Chickasaw plum; but Dr. Hull of S. Illinois, informed us some time ago that he had never met with them, and that he was entirely unacquainted with any such disease. Hence we infer that however destructive it may have been elsewhere, it has not yet made its appearance in Southern Illinois, and possibly may never do so.

THE TRUMPET GRAPE-GALL.

(*Vitis viticola*, O. S.)

[Fig. 76.]

Color—Crimson.

On page 28 of the present volume of the American Entomologist we presented the above illustration (Fig. 76) of this crimson Trumpet Grape-gall, and in answer to D. McClaine of Piermont, N. Y., stated that it was produced by a gall-gnat, and that it was described in our manuscripts under the name of *Vitis lituus*. We have since been informed by Baron Osten Sacken that this gall is his *Vitis viticola*, very briefly described in the "Monographs of the Diptera of N. America," p. 202, as an "elongated, conical, red gall, 0.25 to 0.3 long; on the upper side of the leaves of the grape." The gall will therefore be known by the last name, our *lituus* being invalid. Referring to this gall in a recent letter, Francis

Walker, of the British Museum, informs us that an excrescence of very similar form, but black in color, occurs on the leaves of the Lime tree (*Tilia*) in England; but that the character of the gall-maker has not yet been determined. A French naturalist has, however, detected mites in them, and we have little doubt but the galls are caused by these mites, for mite-galls of somewhat similar form, are common in many parts of this country on the Plum and Cherry, and we shall take occasion, ere long to describe and figure them.

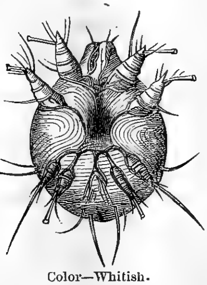
THE PARASITES OF THE HUMAN ANIMAL.

The Itch Mite.

(*Acarus scabiei*, Linn.)

[In the fifth number of our First Volume, we gave, under the above caption, an account of the eight true insects that are parasitic on man, and briefly referred to some other ringed animals, not classed with the true insects, which also prey upon him. Among these last is the common Itch Mite, a microscopic creature which causes that cutaneous disease—the common Itch. We find such an interesting account of this parasite, by B. Joy Jeffries, A. M., M. D., of Boston, in the January number of *Good Health*, that we transmit the article to our columns.—Ed.]

[Fig. 77.]



Color—Whitish.

Our chapter is headed by a magnified drawing of the little animal we are to describe. It is about one-sixtieth to one-seventieth of an inch in length, just visible to the naked eye. By living in the skin of man it produces the disease known as *itch*. To understand how to treat this troublesome affection intelligibly, we must first study the natural history of the animal, its habits and habitats. Before doing this, however, it will be interesting and instructive to glance at the general history of this little creature, called in English the *Itch-mite*, and in Latin, *Sarcoptes hominis*, or *Acarus scabiei*.

There is strong evidence in support of the idea that some of the diseases spoken of in the Bible as prevalent among the Jews were, in reality, due to the ravages of the Itch-mite in the skin. Probably, when mankind began to people the world, these insects began to people *them*, derived, by contagion, from the lower animals previously in existence. From a passage in Aristotle's "History of Animals," it has been supposed that the insect was known to him as the cause of the *itch*. The old Arabian physicians, in their writings, mention it quite plainly—Avenzoar, for instance; but apparently we must come down to the twelfth century for indisputable reference to the Itch-mite, in a work entitled "*Physica*," written, curiously enough, by Saint Hildegard, the Lady Superior of the Convent on the Ruperts-Berg, near Bingen. From that time downwards, the insect has been seen and spoken of by the medical writers of the times, as Guy de Chauliac, Gralap, Benedictus, Paracelsus, Ambrose Paré, Scaliger, Fallopius, Joubertus, Vidius, Schenck, Haffenreffer, Riolanus, Mouffet, and many others. These names carry us down to the early part of the seventeenth century, to Jansen's discovery of the microscope, in 1619. The knowledge of the use of the then primitive instrument soon spread, and the Itch-mite was studied by it, the first rough drawings of the animal being given by Hauptmann. During this (the seventeenth) century, the various writers on medical topics show more or less knowledge of this mite. We will not, however, tire our readers by quoting their names. Some of them mention the custom, which has been a common practice from that day to this, of extracting the Itch-mite from the skin by means of a needle. Although, by this time, the mite had been depicted, and its association with the Itch disease recognized, yet it was not till 1687 that Dr. Bonomo, of Leghorn, and Cestoni, an apothecary, studied our little friend in what we should now call a common-sense way, and thoroughly exploded the old ideas, handed down from one generation to another, that the Itch disease was due to *thickened bile*, *drying of the blood*, *irritating salts*, *melancholic juices*, and special fermentation—the presence of the Itch-mite, when admitted, being accounted for by equivocal generation. These observers saw and described the insects quite perfectly, found their eggs, and discovered the females laying them, and came to the conclusion that the Itch disease or *scabies* arose solely from the presence of an animal which is incessantly biting the skin, and thereby causing the patient to allay the itching by scratching. They also explained the contagious character of the affection by the transference of the insects from one individual to another. Because these discoveries were true, they were denied and combated by the medical writers of those days; yet nearly one hundred and fifty years passed before any better natural history of the mite appeared. King George II.'s physician, Dr. Richard Mead, of London, reported Bonomo and Cestoni's observations to the Royal Society, and published them in No. 283 of the "Philosophical Transactions."

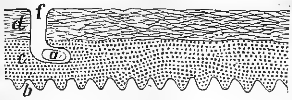
We have given this little historical sketch to show how old the disease is, and how old a knowledge of its cause is also. Notwithstanding, from that time to this (1869) there has not failed to exist medical men or naturalists who deny the connection between the disease called Itch and the Itch-mite. It is with medicine as with everything else in the world—denial of truth excites notoriety, so desired by the many.

In view of what we have above said, it seems impossible to conceive that a correct knowledge of the Itch-mite should be, since Bonomo's time, repeatedly lost in some of the great centres of medical teaching, to be again regained. In 1812, a prize was offered in Paris for the discovery of the little insect; and a certain apothecary named Galés took it, by exhibiting before a medical commission the *Cheese-mite*. Consequently those who searched patients with *Itch* did not find *this* animal, and a prize was once more offered; and Raspail showed the Cheese-mite again, and, when the judges were satisfied, proved it was such, and exposed Galés' duplicity. The cause of the Itch-mite had henceforward its adherents and opposers; whilst, in various parts of the world, the lowest classes understood it, and the methods of its destruction: for instance, the old women in Corsica, who picked them out with needles. Renucci, a native of the Island, probably familiar with these old ladies' occupation, finally, in 1834, taught the Parisian medical world how to find the Itch-mite; and, from that time to this, the insect and its ravages have been more thoroughly and scientifically studied, and the literature of the subject grown up into quite a dermatological library. In 1846, Dr. C. Eichstedt, of Griefswald, and Prof. Kramer of Kiel, independently discovered the male mite. We who now-a-days, have treated the Itch disease, and the natural history of the Itch-mite, naturally feel as if we knew pretty much all about it; yet so late as 1844, Prof. Hebra, of Vienna, gave the German physicians a knowledge or a new and terrible phase of this insect's habits and habitats, in what is known as the Norwegian Scabies, the first recorded case having occurred in that country. And so it probably will always be in the ever-advancing science of medicine, the present generation smiling at the errors and ignorance of the preceding one. But when a truth, like the one mentioned of Hebra's, is discovered, then others are rapidly and constantly being found to confirm it. Other cases were soon reported by observers in Germany.

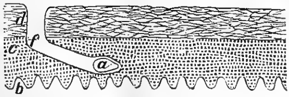
We suppose, by this time, our readers want to know a little more about the insect itself, and perhaps have had hardly patience to read down so far to learn about the strange-looking animal heading our article. At present we include the Itch-mite in the special class of *Acarina*, and if our readers want to know more about the other members of this class, as the Sugar-mite, the Cheese-mite, etc., we would refer them to an article in the September number of the *American Naturalist*, by our friend A. S. Packard, Jr., who gives numerous and beautiful illustrations, accompanied by pleasantly told descriptions. Our article will fill up this chapter for the *Acarus scabiei*, or *Sarcoptes homini*, or Itch-mite. The animal is tortoise-shaped. The head distinct from the trunk, with four pair of jaws. Eight legs, four in front and four behind. The larva has but six legs. Beside the legs are long bristles. The male differs from the female in appearance, as to the bell-shaped suckers on the ends of the legs, and also is not so large. This insect has been found, not alone in man, but in the skin of the horse, lion, lama, ape, Neapolitan and Egyptian sheep, and the ferret. It has been thought, also, that the mites found in many other animals are the same as man's irritating companion, their growth being favored or retarded by their place of development, thus accounting for the apparent differences in shape and size. The Itch-mite lives in the skin, in little passages dug by itself, or, sometimes just beneath the epidermis or scarf-skin. These burrows the animal extends into the deeper layers of the epidermis, down to and into the true skin, or *rete mucosum*, as it is called. The Acarus moults three times, not, however, specially changing in form. The eggs are oval in shape, quite large for the size of the animal, and may be laid by the female to the number of fifty. We give here three drawings, to show how the animal gets into the skin to form the burrows, now called "acarian furrows" by dermatologists.

In Fig. 78 the mite has got down beneath the epidermis. In Fig. 79 it has commenced digging the burrow longitudinally, and the place (*f*) where it was in Fig. 78 has, by the gradual

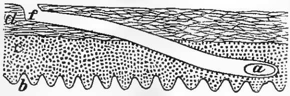
[Fig. 78.]



[Fig. 79.]



[Fig. 80.]



growth of the cells, come up nearer to the surface of the skin. In Fig. 80, the point (*f*) has thus come up to the surface, whilst the mite has gone along further with its burrow. An animal, when it gets on to the skin, crawls till it finds a suitable soft place, when it tips on to its fore-legs, and commences to work its way in. The female, as she progresses, lays her eggs behind her in the burrow, and when exhausted, dies. These eggs will be seen, in a regular row behind the female, in the burrow, under the microscope with one hundred multiplying power. It is not settled how long it takes the eggs to hatch,—from seventy hours to six or seven days. Propably one egg is laid every day. Now, it must be remembered that the skin is constantly wearing off, and as constantly renewed by new growth from beneath; hence, as will be seen by these illustrations, the eggs hatched in the furrow will come to the surface in time for the animal to escape from its shell when fully formed. The canals which the female acari burrow, have generally a serpentine form, and are from a twelfth to a quarter of an inch in length. They show on the surface of the skin a whitish dotted appearance, the dots corresponding to the eggs,—the female, as seen in the cuts, being at the *blind end of the burrow*. Ignorance or forgetfulness of this fact has been the cause of the Itch-mite escaping detection. There will be a little pimple or vesicle on the skin over where the mite went in; and, as we see from these figures, the animal is not there, but off at some distance deeper in the skin; hence, if we open the little vesicle, or cut it out, the insect escapes us. The old women in Corsica, and other parts of the world, knew better, and with a needle dug out the acarus from the end of the burrow. A surer way of obtaining it, and the whole burrow, is to clip this off with a fine pair of curved scissors, commencing at the blind end where the mite lies buried. Of course a little experience is required to do this work successfully. Then, if we place this little lamina of epidermis on the microscope-slide, and a covering-glass over it, but without fluid, we shall most likely find the female acarus and the eggs she has laid behind her. A magnifying power of sixty to one hundred times is quite sufficient.

After this animal had been proved to be the sole cause of the disease called *itch*, medical men thought it was always necessary to find the mite to be sure that their patient had the itch. From the history above given, and explanations just made, we can see how natural it was that they should so often fail in this, and therefore conclude that their patient was not the victim of this animal parasite; consequently he was not properly treated, and did not get well—*he continued to itch*. Hence, to account for this, and cover up ignorance, was invented the "Jackson itch," the "Seven-years' itch," and, lately, the "Army itch." We conclude the first did not derive its name from our former President, but was only popular during his reign. The second was ingenious, for if a patient was told he had the "seven-years' itch," he naturally concluded that he could not get rid of it in less than that number of years, which gave *time for treatment*. As time goes on, soap and water, and personal cleanliness, become more popular, hence the Itch-mite has become less and less common. In the old New England days it was the pest of the village-school, the town poor-house, and the city jail. During the rebellion, the great armies, on the march and in the field, of course, had no opportunities for personal cleanliness, so as to prevent the contagion of the itch-disease, therefore it spread with great rapidity by contact, and the effects of the mite's presence in the skin would also be severe. The various army surgeons had not been accustomed to any such cases; they searched in vain for the insect, and, repeatedly failing to discover it, finally concluded there must be an itch-disease not due to the itch-mite, and called it the "Army Itch." These cases often were furloughed, and, in the cities at home, came under the care of those who, from special study of cutaneous diseases, were more familiar with the means of obtaining the parasite, as we have above described, when search for it always revealed the true cause.

This mite, in burrowing into the skin, produces intense itching, and sometimes a vesicular eruption on the surface; but this is all. The intense itching, however, causes those infested to scratch themselves incessantly, night and day; and they consequently tear and lacerate the skin in every direction. The mite, as we said, needs a delicate part of the skin to dig into,—between the fingers, for instance,—and here the peculiar looking burrows are first sought for. The portion of the skin of the whole body particularly ravaged by this unpleasant parasite are so definite, that those familiar with cutaneous diseases can, at a glance, say whether the patient has the *itch.* It must be remembered that several other diseases of the skin cause as bad itching as the Itch-mite; but the special portions of the general integument are, however, so marked to the practiced eye, that we no longer feel any need of finding a mite in its burrow to establish our diagnosis and treatment. In fact, we might spend a long time in fruitless hunt, when the trouble has lasted sometime, or treatment has been attempted.

We seem, perhaps, very precise and prosy in all this; but, during and since the war, so much scabies has been diffused through our country, that many family physicians are called upon to treat what they have never before seen, and their want of immediate success should not tell against them. We only desire the community and physicians to understand that the Jackson Itch, the Seven-years' Itch, and the Army Itch, are all due to the presence in the skin of one and the same animal, namely, the *Acarus scabiei*, or *Sarcoptes hominis*, the Itch-mite depicted at the commencement of this article.

How now, finally, can we get rid of our minute, insinuating, and irritating friends? They lie stored away beneath the hard layer of the scarf-skin; this, therefore, must be removed, in order to expose them; then something fatal to them, but not hurtful to the skin, must be brought in contact with them, and finally the excoriations and eruptions caused by the constant scratching must be properly treated. The severity of these latter symptoms depend, of course, on the length of time the person had been affected; that is to say, upon the number of Itch-mites which are committing ravages upon him, and partly on the degree of the sensibility of the skin. As long as the person lives, the mite will flourish upon him, till it is destroyed by proper methods. In the illustrations (Figs. 78, 79, 80), the mite, as is seen, is quite deep in the scarf-skin; our first efforts towards treatment must therefore be to soften and break down or rub off this epidermis. Every one is familiar with the effect of the long-continued application of warm water and soap to the skin, how it swells up the scarf-skin, softens it, and renders it easily scraped or rubbed off. Therefore a person with this highly unpleasant trouble must first thoroughly soak himself in hot water, and rub all parts of the body which are the abodes of the mites with the strongest soft soap. This will be half an hour's work. The more delicate the skin, the shorter time required. Next, the common sulphur ointment must be rubbed thoroughly over the body. This touches and is fatal to the Itch-mite, already exposed in whole or part by the burrows being broken down by the soft soap and hot water. If it does not produce too much irritation, the ointment might be left on over night, and removed by a hot bath in the morning. With a delicate skin, sulphur soap can be used instead of sulphur ointment. If one such application does not suffice, it must be repeated. All the patent and popular medicines advertised lately, on account of the itch being so widely spread through the country, are pretty sure to depend for their success on the presence of sulphur, the smell of which is hid, more or less, by other ingredients. There are many other substances used by physicians to destroy this parasite. The above described method will be sure to succeed if *thoroughly carried out*, as of course a few mites left will soon multiply and again annoy the patient. Those who are out of the reach of medicines and hot baths, may often succeed in getting rid of their minute friends, by bearing in mind the general laws of treatment; namely, that the hard scarf-skin must be softened and broke down, and afterwards whatever kills the acari, and does not hurt the skin, be applied. Necessity will be the mother of invention.

Nothing is more difficult, or, in fact, dangerous, than to give medical directions to be followed by the community. We would most strongly advise any one suffering from the ravages of this little pest to apply to a physician, and let him conduct the treatment. Those who make a specialty of cutaneous medicine, fortunately, nowadays, have a large choice of substances and methods of application, which can be adapted to the social condition, the degree of cutaneous sensibility, and the age and sex of the patients applying to them. This is of more importance than would at first sight appear. It must be remembered that the skin is torn and lacerated by the victim's scratching, from which we have an *artificial* inflammation of the surface, to be always taken into consideration in our method of treatment. A thick-skinned laborer needs very different applications from a delicate child, or feeble woman. We therefore again caution against self-treatment.

A single word in regard to the clothing. All under-clothes should be washed thoroughly. Outside garments, contrary to the generally-received idea, do not need anything done for them. In the great hospital at Vienna, fifteen hundred cases are treated yearly, and no attempt at disinfecting the clothing is found necessary. The *mite lives in the skin*. It will therefore be seen that contagion comes from personal intercourse, particularly from hand to hand. The most high-bred, refined, and cleanly, are not exempt. Although thus highly contagious from the mite being passed from one to another, yet students of medicine in contact with it rarely get the itch; and the writer has examined and handled hundreds of cases with impunity.

A NEW BEAN-WEEVIL.

BY S. S. RATHVON, LANCASTER, PA.

(*Bruchus obsoletus*, Say.)

A new destructive insect belonging to the *Bruchus* family of Beetles has developed in Lancaster county within the last five years, infesting the ripe seed-beans. Dr. Jno. L. LeConte, after examination, is of opinion that it should be referred to *Bruchus obsoletus* of Say, "though there still seems to be some doubt upon the question." Dr. L. writes that he has had specimens of *Bruchus varicornis*, raised from beans and Cow-peas, but the species under consideration differs from that, in having the feet, and the base and last joint of the antennæ, black, whilst in *varicornis* they are testaceous. Mr. Say describes *B. obsoletus* substantially as follows: "Length over one-tenth of inch; body blackish cinereous, with a slight tinge of brown; antennæ not deeply serrate; thorax much narrowed before, cinereous, on each side a slight impressed dorsal line; base with the edge almost angulated, central lobe almost truncate; scutel quadrate, whitish, longitudinally divided by a dusky line; elytra with the interstitial lines having a slight appearance of alternating whitish and dusky; on the middle of the third interstitial line is a more obvious abbreviated whitish line; posterior thighs with a black spine, and two smaller ones." Say further remarks, that "the whitish or cinereous markings are not very striking; on the elytra they may sometimes be traced into two obsolete macular bands." I had perhaps four or five hundred specimens under my observation, and found that whilst many of them agreed substantially with Say's description, yet the larger number differed. In some specimens the anterior and intermediate feet were testaceous, and in very few was the scutel whitish. Very few seemed to be banded on the elytra. Say obtained his specimens in Indiana, from the seeds of a species of *Astragalus*, a variety of "Milk-Vetch," in August, and in company with *Apion segnipes*, one of the pear-shaped weevils. My specimens evolved in the months of June, July, August and September, from three varieties of the domestic bean (*Phaseolus*), commonly called "Cranberry," the "Agricultural," and the "Wrens-egg" beans, obtained from Mrs. P. C. Gibbons, Enterprise, Lanc. Co., Pa. The *larva* is a whitish footless grub, with a small brownish head, rather more than the tenth of an inch in length, and very similar in form to that which infests the pea and the chestnut. The presumption is that this insect deposits its eggs in the young bean while it is green and in the pod, in the same manner that the pea-weevil does, with this very remarkable difference, that in the *pea* we usually find but one insect, and in many instances the germ remains intact, but in the *bean* we find from five to ten or more, in a single seed, and in the latter case they cannot possibly all germinate. I have not yet heard of this insect being found in any other locality in Lancaster Co. than the one above named. The tenant from whom Mrs. Gibbons received these infested beans has been engaged in the bean culture for twenty-five years on the same farm, and never noticed these weevils until within the last two or three years, and only last year did their destructive character become conspicuously apparent; for out of a small sack of seed-beans hung away, containing less than two quarts, she gathered nearly a teacup full of the weevils at planting time, in the early part of June, and had all been infested as those were which she brought to me, she could have easily doubled the quantity. About five years ago Mrs. Gibbons received some seed-beans of the "Cranberry" variety, from Nantucket, Mass., and prior to that, she also received some from the Agricultural Department of the Patent Office, and with the one or the other of these, the impression is, that the weevils must have been received—the variety received through the latter being the "Agricultural." As the Department of Agriculture imports seeds of various kinds, and beans among the rest, an opinion prevails that this insect may have been imported with the beans; and whether they were brought from Washington City or from Nantucket to this county, this opinion may be well founded in either case, although we may not be able to account for Say's finding them so long ago in the seeds of the *Astragalus*, in Indiana. A known European bean-weevil is the *Bruchus rufimanus*, Sch.; but our insect, according to the following description from Stephens' Manual, is plainly not the *rufimanus:* "Oblong-ovate; black; thorax with a snowy spot before the scutellum; elytra spotted with white; base of the antennæ and the anterior legs testaceous-red; hinder thighs with an obsolete obtuse tooth." Some have also supposed it to be identical with *Bruchus fabi*, which is another foreign "bean-weevil," but I have not access to a description of that insect, and I am therefore unable to say anything further in that relation. Specimens were also sent to Mr. Austin, a Coleopterist, of Cambridge, Mass., and he says the insect is quite common in that State, and that the Entomologists there have labeled it *Bruchus fabi*, but does not state upon what authority, or where a description may be found. Stevens, in his "Manual of British Coleoptera," describes twelve species of *Bruchus*, but *fabi* is not among them; so that, if it is a foreign importation, it is most likely brought hither from the continent of Europe.

Probably the most effective, if not the only remedy, to destroy this Bean-weevil, would be to subject the ripe beans, in Autumn, to a heat not too intense to destroy germination, yet great enough to destroy the larva, or the vitality of the egg of the insect. Curtis, in his "Farm Insects," says that the germinating powers of wheat is preserved at about 190 deg. of Fahrn., but that a lower heat, long continued, is more effective than a higher degree applied only for a short period. Beans would probably not bear so great a heat as grain, but, by experimenting, the safe mean may be attained. It is also recommended that immediately after gathering the beans, they should be thrown into boiling water, and left in for one minute, as the young larva may *then*, by this means, be killed. As an article of food, beans, infested with weevils, are known to be very unwholesome to man or beast.

[We can find no notice anywhere of any European *Bruchus fabi*, Linn., and the author who is made to shoulder the name, would certainly never have committed the atrocious blunder of writing *fabi* for *fabæ*. The nearest approach to it is *Bruchus viciæ*, Oliv., of which we have no description; but all the other European species of *Bruchus* differ from this bean-weevil, of which Mr. Rathvon has been kind enough to send us specimens, and we therefore consider it indigenous, and rightly referred by LeConte to *obsoletus*, Say. It differs essentially from the European *granarius*, which will be found figured in our "Answers" in this number, and also from *flavimanus*, Schönh., both of which species Curtis found preying on English Broad-beans.* Mr. Jas. Angus, of West Farms, N. Y., sent us in the forepart of November numerous specimens of this same weevil, with the account which appears in our "Jottings from Correspondents." There were no less than 14 in a single bean, and many were still soft and white, while a few were in the pupa state. Many of these specimens disagree with Say's description in the points already mentioned by Mr. Rathvon, but as some of them accord very well with the description, and as Say does not mention how many specimens he examined, those differences can be considered only as variations.—Ed.]

* Farm Insects, pp. 363-4.

THE PLUM CURCULIO WILL DEPOSIT IN FRUIT WHICH OVERHANGS WATER.

BY DR. I. P. TRIMBLE, OF NEW JERSEY.

Much has been written about planting fruit-trees so as to lean over water, as a way of preventing the depredations of the Curculio. At the late meeting of the American Pomological Convention in Philadelphia, Dr. Underhill, the well-kown grape-grower at Croton Point, New York, asserted boldly, when the subject of Plums was under discussion, that the fruit on his trees, planted so as to lean over the water, *was never stung by the Curculio.*

It so happened that some members of the Convention who have investigated this matter, were not present when this strange assertion was made, or it would have been controverted on the spot.

I feel that in the fight against insects injurious to fruit, and especially against the Curculio, the first thing necessary to be done is to dispel the delusion which prevails so generally in the minds of the people, that there is some other way than killing them. I have no more faith in planting over water, than in scores of other plans that have had their advocates. People have had plums after using them, just as they have had when nothing has been used; but all these plans have failed when fairly tested.

On the 25th of July, 1863, I was one of a party to visit the vineyards of Dr. Underhill, of Croton Point, on the Hudson River. That gentleman had solicited the appointment of a committee at a meeting of fruit-growers, to examine his mode of cultivating grapes. The visit was a most pleasant one.

While here, we visited the Doctor's Plum trees planted round an artificial pond. They stand at an angle of about 45 deg., and so close to the edge of the bank that the greater part of the branches are over the water, so that when the fruit comes to maturity on these trees, a boat will be necessary to gather the greater part of it. In a very careful examination of those trees having fruit on at this time, we found it badly punctured by the Curculio. On the plums high up on the trees, and especially on those branches leaning furthest over the water, it was impossible to see whether the crescent mark was there or not; but wherever near enough to be examined, we could see no difference between those plums hanging over the water and those over the land. They were just as badly marked by the punctures of the Curculio as were the plums on some trees at the neighboring station of Croton; just as badly stung as in Newark and other places I had visited that year on purpose to see the extent of the ravages of the Curculio. Gentlemen who have often seen these trees other years, have told me that they have always had a similar experience.

Dr. Underhill, like others, has had crops of plums, and these crops have probably been ascribed to the circumstance that they grew over water; and he believes that the merit of the plan is attributable to the sagacity or instinct of the insect: *That she must not deposit her eggs in fruit so situated that it will fall into water.* To carry out this theory, it would be necessary for the Curculio to know that the plums in which she deposits her eggs *will fall* from that tree; that if they fall into the water, the grubs they contain *will perish;* that if they fall on land they *will be safe.* The question here arises—Has the Curculio such instincts, or such sagacity?

In this world of wonders in which we live, there is nothing so wonderful as the instincts of insects. The impulses that control their actions are strangely perfect. They are no more likely to go wrong than a machine. We do not know what instinct is. We cannot define it. No matter how we put words together, they will give no adequate idea of what this blind impulse is. We cannot weigh, measure, see, or feel what is called gravity. But it is that *something* that keeps the universe in order; that *something,* in the ordering of the *Almighty*, that prevents one world from jostling another, and creation from falling into confusion.

Who can understand how the *Cicada septendecim*, after passing nearly seventeen years underground, should come to the surface in the evening of a certain day of the month, with almost exact regularity, generation after generation, for centuries? How should a certain kind of wasp know, that when she builds a cell of mud for the reception of her egg, she must put in a supply of insects for food for the young that will be born of that egg, and that at a certain future day she must break open that cell, and give her young a fresh supply? Who teaches the neuter bee—that nondescript that cannot be a parent—how to fabricate a cell for the young of another? Such curious instances of the instincts of insects could be multiplied till they would fill a volume, and all would be wonderful—equally beyond our understanding, but all consistent with their wants, and in accord with the rest of nature. Those who carefully observe these things will feel that they are in a world overruled by an *Omnipresent Guide* of all things. But the *Superintending Guide* that teaches the little Curculio to deposit her eggs in fruit where the future young will find food, would hardly give her an instinct to guard her against depositing that egg where fruits never grow except on trees planted contrary to nature.

We were told to-day that the tides were sometimes so low as partially to drain this pond, and it was then the Curculio punctured the fruit over where the water should be. The same special instinct that would teach her to avoid the water, should also admonish her to avoid the danger of the tide-water mud, the one being as fatal to the future grub as the other.

Planting fruit trees in this way will certainly diminish the number of Curculios; but as long as millions of young apples are permitted to lie undisturbed on the ground in the orchards in the neighborhood, to bring forth their vast armies for the next year, it will hardly be worth while to dig such ponds and plant trees round them in such an awkward position for the little good they would do. The embryo Curculio in the fruit that falls into the water will perish undoubtedly; but that water, or the fear of it, will not prevent the parent using that fruit. The teachings of instinct are so exact and unvarying that one punctured plum over water explodes the theory; and if the theory is correct, a tub of water under a tree must protect a column of plums of the tub's circumference from the bottom to the top of that tree, and that certainly would be a curiosity with some of the light-colored, full-bearing varieties.

It is not at all likely that many will plant trees in this way; but as some have done so, I have been thus explicit on this point, to guard others against such an expensive and awkward way of trying to outgeneral the Curculio, since reason and observation teach us that it is of very little value.

In order to add weight to my own testimony, I copy the two following letters, which bear on this subject:

DR. I. P. TRIMBLE—*Dear Sir:* I very well remember our visit at Croton Point, by request of Dr. Underhill, made to "The Fruit-Growers' Club" for a "committee" to examine his vineyards. Dr. U. especially called our attention to his success of growing plums over water, and of their not being attacked by the Curculio.

The account you published soon after was true in every particular. I remember your picking off plums and showing the crescent marks to all of the committee as well as to Dr. Underhill himself. I remember also distinctly the Doctor's remark, that although they were stung "the NIT NEVER HATCHED."

I have visited the Doctor's plum trees since, and have seen the plums just as much punctured by the Curculio as in many other places where the trees did not lean over the water.

I know several others who planted trees to lean over the water, but the "Little Turk" did not favor them, that I could discover.

Truly, yours, R. W. HOLTON.

HAVERSTRAW, Dec. 22, '69.

DR. I. P. TRIMBLE—*Dear Sir:* I have at last seen the person I spoke to you about; his name is John Howlett, a florist of this city. Some few years since, on the place where he then resided, was a pond of water, and in the centre of the pond a small island just large enough to grow a tree. On this island he planted a plum tree, and a row of plum trees all around the pond on its edge. Persons then, as now, asserted that in such positions they would be free from the depredations of the Curculio; but, as Mr. Howlett has just remarked to me, it had not the least effect; the fruit was stung and dropped quite as much as anywhere else. In fact, he got no fruit, and the plan was a total failure, though Mr. Howlett is an excellent practical gardener, and knew well how to care for his trees. The varieties were the leading kinds, such as Columbia, Smith's Orleans, Imperial Gage, Washington, etc.

Respectfully, JNO. SAUL.

WASHINGTON, D. C., Dec. 14, '69.

☞ There is yet a vast and unexplored field for the Entomologist in the South. Our Southern brethren suffer from some of the most grievous insect foes, and their insect fauna is rich and diversified. We consequently take pleasure in announcing, that Mr. J. Parish Stelle, of Savannah, Tenn., is at work in the field, and will continue to send us the "Southern Notes" which were commenced in the last number.

THE GOAT-WEED BUTTERFLY.

(*Paphia glycerium*, Doubleday.)

[Fig. 81.]

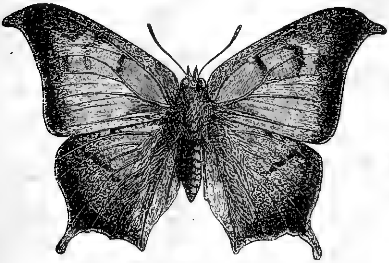
Colors—(*a*) pale glaucous-green; (*b*) grayish-green

There is an interesting and rare butterfly known to entomologists by the name of *Paphia glycerium*, which occurs in Missouri, Texas, and Illinois, and perhaps in other southwestern States. It is an interesting species on account of the dissimilarity of the sexes, and of the position it holds among the butterflies; and as its natural history has never hitherto been recorded, we will briefly transcribe it from notes and specimens which were kindly sent to us last September by Mr. J. R. Muhleman, of Woodburn, Ills., and from further facts communicated by Mr. L. K. Hayhurst, of Sedalia, Mo.

Dr. Morris, in his "Synopsis of the Lepidoptera of North America," places this butterfly with the *Nymphalis* family, of which the Disippus Butterfly (*Nymphalis disippus*, Godt., A. E., I, Fig. 133) is representative. The larva, however, has more the form and habits of that of the Tityrus Skipper (genus *Goniloba*), while singularly enough, the chrysalis resembles that of the Archippus Butterfly (genus *Danais*), which we figured on page 28 of our first volume.

The larva feeds on an annual (*Croton capitatum*) which is tolerably common in Illinois, Missouri, Kentucky, and westward, where it is known by the name of Goat-Weed. The plant has a peculiar wooly or hairy whitish-green appearance, and in the month of September its leaves may frequently be found rolled up after the fashion shown at the left of Figure 81, with the larva inside. This roll of the leaf

[Fig. 82.]



Colors—Coppery-red and brown.

is generally quite uniform, and is made in the following manner: Extending itself on the mid-vein, with its head towards the base of the leaf, the larva attaches a thread to the edge, at about one-fourth the distance from the base to the point. By a tension on this thread, it draws this edge partly toward the opposite one, and fastens it there, being assisted in the operation by the natural tendency of the leaf to curl its edges inwards. Fastening a thread here, it repeats the operation until the edges meet, and then it proceeds to firmly join them nearly to the apex, leaving a small aperture through which to pass the excrement. During hot days the larva remains concealed in the leaf, and towards evening comes out to feed, though sometimes it feeds upon its house, eating the leaf down half way from base to point. It then abandons it and rolls up a new one. In the breeding cage, when placed in a cool shady room, the larva seldom rolls up the leaves, but feeds at random over the plant, and when at rest simply remains extended on a leaf. From this we may infer that its object in rolling the leaves is to shield itself from the rays of the hot August and September sun; for the plant invariably grows on high naked prairies.

The young larva has a large head, larger than the third segment, which is the largest in the body. The head preserves its general form through the successive moults: it is light bluish-green, thickly covered with papillæ of a dirty white color, and there are also a number of light orange papillæ of a larger size scattered among them. The skin of the caterpillar is *green*, but the general hue is a dirty white, owing to the entire surface being very closely studded with white or whitish papillæ with dark brown ones interspersed. These prominences are hemispherical, hard, opaque, shining, and the larva feels rough and harsh to the touch.

At each moult some of these papillæ disappear, especially *all* the brown ones, the body increases in size so that the head is smaller than the third segment, the green color of the skin becomes more apparent, the body is softer to the touch, and the whole larva assumes a neater appearance.

[Fig. 83.]

Colors—Light orange-brown and dark brown.

Thus this larva has very much the same peculiar whitish glaucous-green color as the plant on which it feeds; and any one who has seen it upon the plant, cannot help concluding that it furnishes another instance of that mimickry in nature, where an insect, by wearing the exact colors of the plant upon which it feeds, is enabled the better to escape the sharp eyes of its natural enemies. When full-grown, which is in about three weeks after hatching, this worm* (Fig. 81, *a*) measures 1½ inches, and although, as above described, the little elevations frequently disappear so that it looks quite smooth, yet sometimes they remain until the transformation to chrysalis takes place, as was the case with two which we bred.

Preparatory to transforming, it suspends itself by the hind-legs to a little tuft of silk which it had previously spun, and after resting for about twenty-four hours with its head curled up to near the tail, it works off the larval skin and becomes a chrysalis. This chrysalis (Fig. 81, *b*)

* From five full-grown specimens sent by Mr. Muhleman, we draw up the following description. Length 1 50 inches. Cylindrical. General appearance shagreened pale glaucous-green, lighter above stigmata than elsewhere. Ground-color of body clear green. Thickly covered with white papillæ or granulations, which are often interspersed with minute black or dark brown sunken dots. Head quite large (rather more than ½ as large as the 3rd segment), nutant, subquadrate, bilobed, granulated like the body, but with the black sunken dots more numerous, and having besides, several larger granulations above, some four of which are generally black and the rest fulvous; a row of three very distinct eye-spots at the base of palpi; the triangular V-shaped piece elongated and well defined by a fine black line, and divided longitudinally by a straight black line; palpi and labrum pale, the latter large and conspicuous; jaws black. Neck narrow, constricted, green, smooth and retractile within first segment. Segments 1—3 gradually larger and larger; 3 to last gradually smaller. Stigmata fulvous. Venter less thickly granulated than tergum.

is short, thick, rounded, and of a light green; sometimes becoming light gray, and being finely speckled and banded with dark gray. The skin is so thin and delicate that the colors of the future butterfly which in two or three weeks escapes from it, may be distinctly seen.

The male butterfly (Fig. 82) is of a deep coppery-red on the upper side, bordered and powdered and marked with dark purplish-brown, as shown in the figure. The under side is of a *feuille morte* brown with a greasy lustre, the scales being beautifully shingled transversely so as to remind one of that article of dry-goods which the ladies call rep; while the bands which commenced on the front wings above, may be traced further across the wing, and there is a transverse band on the hind wings, with an indistinct white spot near the upper edge. The female (Fig. 83) is of a lighter color than the male, marked with purplish-brown as in the figure, the transverse bands being quite distinctly defined with very dark brown. The under side is very much as in the male.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 5.

The Abbot Sphinx.

[*Thyreus Abbotii*, Swainson.]

[Fig. 84.]

Colors—*Larva*, brown; *moth*, chocolate-brown and yellow.

This is another of the large Grape-feeding insects, occurring on the cultivated and indigenous vines and on the Virginia Creeper, and having in the full-grown larva state, a polished tubercle instead of a horn at the tail. Its habitat is given by Dr. Clemens, as New York, Pennsylvania, Georgia, Massachusetts, and Ohio; but though not so common as the Sphinx Moths described in former articles, yet it is often met with both in Illinois and Missouri. The larva which is represented in the upper part of Figure 84 varies considerably in appearance. Indeed, the ground-color seems to depend in a measure on the sex, for Dr. Morris describes this larva as reddish-brown with numerous patches of light-green, and expressly states that the *female* is of a uniform reddish-brown, with an interrupted dark brown dorsal line and transverse striæ. We have reared two individuals which came to their growth about the last of July, at which time they were both without a vestige of green. The ground-color was dirty yellowish especially at the sides. Each segment was marked transversely with six or seven slightly impressed fine black lines, and longitudinally with wider non-impressed dark brown patches, alternating with each other, and giving the worm a checkered appearance. These patches become more dense along the subdorsal region, where they form two irregular dark lines, which on the thoracic segments become single, with a similar line between them. There was also a dark stigmatal line with a lighter shade above it, and a dark stripe running obliquely downwards from the posterior to the anterior portion of each segment. The belly was yellow with a tinge of pink between the prolegs, and the shiny tubercle at the tail was black, with a yellowish ring around the base. The head, which is characteristically marked, and by which this worm can always be distinguished from its allies—no matter what the ground-color of the body may be—is slightly roughened and dark, with a lighter broad band each side, and a central mark down the middle which often takes the form of an **X**. This worm does not assume the common Sphinx attitude of holding up the head, but rests stretched at full length, though if disturbed it will throw its head from side to side, thereby producing a crepitating noise.

The chrysalis is formed in a superficial cell on the ground; its surface is black and roughened by confluent punctures, but between the joints it is smooth and inclines to brown; the head-case is broad and rounded, and the tongue-case is level with the breast; the tail terminates in a rough flattened wedge-shaped point, which gives out two extremely small thorns from the end.

The moth (Fig. 84, below) appears in the following March or April, there being but one brood each year. It is of a dull chocolate or grayish-brown color, the front wings becoming lighter beyond the middle, and being variegated with dark brown as in the figure; the hind wings are sulphur-yellow, with a broad dark brown border breaking into a series of short lines on a flesh-colored ground, near the body. The wings are deeply scolloped, especially the front ones; and the body is furnished with lateral tufts. When at rest the abdomen is curiously curved up in the air.

SOUTHERN NOTES.

BY J. PARISH STELLE, SAVANNAH. TENN.

THE COMING COTTON WORM.—We have a class of croakers in the South—and I suppose every section has them—who are continually trying to discourage better and more useful people than themselves, by predicting some serious calamity for the future, and pretending to base their predictions on certain unfailing signs and circumstances. In the spring they look at the crawfish holes and predict a frightful drouth for the approaching summer—such a drouth as will render all previous work on the plantations a mere waste of exertions. But the drouth fails to come, and they say nothing about the failure of a "sign;" in fact I am not sure but they *forget* all about it: they go on with their wise predictions, however. The corn-husk appears unusually thick in consequence of there having been a good season, and there they discover a sign that has never failed—a remarkably early frost and the tightest winter on record is to be expected. It misses again—the next infallible sign turns up—some other most discouraging thing is predicted, and so it goes on, *ad infinitum*.

At present our croakers are prophecying terrible ravages from the Cotton worm (*Anomis xylina*, Say), for the next season, and they are giving several reasons for their position; one of which is that the insect is periodical in its visits, like the *Cicada*, and that 1870 is the year for its dreaded return on a large scale.

Let me say to my Southern friends that this is all a mistake. My experience has convinced me that the insect in question is not periodical, and that the fact of its appearing in greater numbers some years than others, may be attributed simply to the character of the preceding winter. If you notice the matter carefully you will find it invariably the case that the cotton caterpillar is worse after a mild winter than after a severe one, all of which is doubtless owing to the fact that frosts or freezes tend to destroy the chrysalis of the insect.

Last winter was a severe one at the South, and the caterpillar was not so bad as usual; though I remember that early in the season there was almost a panic in some of the States, growing out of certain newspaper reports to the effect that the caterpillar had already appeared, and that there would be no cotton raised. The people looked over their cotton on reading the report, saw worms which they mistook for the dreaded caterpillar, and almost gave over in despair; and as a consequence we have many pounds of cotton less to-day than we would otherwise have had. There were no cotton caterpillars anywhere in the South at the time the false report got into circulation, and it all grew out of either ignorance on the part of reporters, or willful lying on the part of speculators.

In this connection I propose giving a few simple rules by which our planters—especially those who are new in the South—may identify the true Cotton caterpillar from other comparatively unimportant worms that appear among the plants. There is one known as the "Grass worm" that looks very much like it—doubtless the very individual that caused the scare last season. There is sufficient difference in their appearance, however, to render it an easy task to distinguish them apart, when one knows where to look for the difference. The true Cotton worm has six front feet, two anal and eight ventral; the two foremost of the ventral being very small, and having no apparent office to perform in the movements of the insect; while the feet of the Grass worm are all perfectly formed, and all brought into use when moving from place to place. The Cotton worm bends itself up in order to move, something after the manner of the span or measuring worm, while the Grass worm moves smoothly along simply by the action of its feet. These characteristics alone would enable you to distinguish the two worms, but there are still others, one or two of which I may mention. The Cotton worm has a habit of doubling itself up suddenly when disturbed, and springing some distance, whereas the Grass worm simply rolls itself up and lies motionless. When about to change, the Cotton worm spins a loose cocoon or web among the leaves of the plant, some distance from the ground, while the Grass worm goes into the ground without having first spun any web at all.

There is a great difference in the appearance of the two moths, but I shall not take time to mention it in this article. They are not far from the same size, but while at rest the wings of the cotton moth lie back like those of an ordinary fly, while those of the grass moth spread out after the usual manner of moths. The wings of the former are of a reddish-brown color, with a dark spot having a light centre in the middle of each, while the color of the latter is a grayish-brown, clouded and barred with alternate light and dark shades.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund, and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

BEAN-WEEVILS—*West Farms, N. Y., Nov.* 1, '69.—I enclose you a sample of beans to show you how thoroughly and effectually this little vagabond is plying his time-immemorial avocations in the bean-patches in this quarter. Five or six years ago I had occasion to call on a neighbor, and in passing through the barn he pointed out to me a heap of threshed beans, on the floor, of the Early Mohawk variety, which he said had been destroyed by bugs getting into them since they were threshed. (?) A casual inspection showed that they were destroyed sure enough. At least one-half of them were as badly infested as the sample I send you, but as I pointed out to him, the damage which was now an accomplished fact, had been commenced during the growing season, and the "bugs" were now leaving the beans instead of entering them.

Next season I found a few among my own beans, and they have been on the increase ever since; and this year my Yellow Six Week variety are nearly as bad as my neighbor's referred to above. They are nearly as bad this year on a pole variety, the "Dutch Case Knife," as they are on the low growing ones. The small black bush variety, however, seems to have escaped them. If some check is not put to their ravages soon, the culture of beans will have to be given up here. JAS. ANGUS.

[The weevil is the *Bruchus obsoletus*, Say, about which we publish an article from Mr. S. S. Rathvon, in another portion of this number.—ED.]

HARMLESS PARASITES ON THE LARVA OF THE LUNA MOTH—*Covington, Ky., Jan.* 21, '70.—Last summer I took, feeding on walnut leaves, a mature larva of *Attacus luna*, upon which I counted about 22 eggs like those of a *Tachina* fly; but I did not breed any parasites, and I cannot conceive what became of them. Not only was there a black patch under each egg, but under some I distinctly saw with a lens a minute orifice by which the parasite had entered the integument of the Luna larva. There may have been a few more than 22 eggs, as I counted that number and then desisted from uncertainty as to whether some had not been counted already. The larva became a pupa and about the middle of last May produced a very fine moth, which I now have. There was no room for mistake, as this larva, and one which I took a few days previously, and which had already "spun up" when I took this one, are the only two *Luna* larvæ that I ever saw, and both produced the moths. I have met with no similar instance in my entomological reading, and I supposed that a parasite once in the body of its host, death invariably resulted. I can imagine, however, that one, or a few, parasitic larvæ might perish at an early stage of their existence without destroying the host; but this would hardly happen with so many as there were in this instance, unless the present parasite had made a mistake in depositing its eggs upon the Luna larva, so that its progeny consequently found an uncongenial habitat, and therefore perished. V. T. C.

THE HANDSOME DIGGER WASP AS A HORSE GUARD, AGAIN—*Clarksville, Tenn., Dec. 25th,* 1869.—Allow me to state in confirmation of my previous remarks, that I saw one of the specimens of the Handsome Digger Wasp which was sent to you, carry a Horse-fly into its nest. I secured the wasp as it came out of its hole, then dug up the nest, which had five horse flies in it, and one half-grown wasp larva. I could produce many witnesses to substantiate their habits as I have stated them. Not only do they catch Horse-flies, but like the Bald-faced Hornet (*Bembex fasciata*), they catch house-flies also, though I do not know whether they provision their nests with these last, nor have I ever known them to catch grasshoppers.

A. H. R. BRYANT.

MR. WALSH'S PORTRAIT.

Our readers will be a little disappointed in not receiving with this number, the portrait of our late associate, which was promised last month. Bear with us yet a little while. A poor portrait is worse than none at all, and rather than hurry the artist, we have decided to give him plenty of time, and to send the portrait with the next, instead of with the present number of the ENTOMOLOGIST.

☞ Remember, that every one who sends us five subscribers to the AMERICAN ENTOMOLOGIST, is entitled to an extra copy free of charge!

ERRATUM.—Page 101, column 2, line 25, for '*Cecropia*' read '*Cecropiæ*;' same column, note, for '*Chalcis maria*' read '*Chalcis mariæ*.'

☞ In order that the proper authorship be given to such new species or genera as have been described in the ENTOMOLOGIST, it becomes necessary, now that our associate is no more, to explain in some part, the manner in which the editorial department was conducted. It was so agreed between Mr. Walsh and ourselves, that in consideration of the time we devoted to the illustrations and to other general editorial work, he should furnish on an average two-thirds and we but one-third of the reading matter. In point of fact, the articles written under the editorial "we," were made as conjoint as possible, by a constant interchange of individual facts and experience; and it was decided that, whenever either one of us wished to publish any discovery peculiarly his own, or to describe a new species in which the other had no interest—he should write under the individual signature of "Senior Editor" or "Junior Editor." Thus, all descriptions of new species that have heretofore appeared in these columns under the editorial "we," should be credited to "Walsh and Riley," and such as appear under the signature of either one or the other, separately, should be credited accordingly.

☞ We regret exceedingly that our book notices, and notices of exchanges, have been unavoidably crowded out of this number.

MISSOURI ENTOMOLOGICAL REPORT.—In answer to several inquiries lately received, we will state that the First Annual Report of the State Entomologist of Missouri can be had, without plates, by sending fifty cents to C. W. Murtfeldt, Secretary of the State Board of Agreculture, 612 North Fifth street, St. Louis; or with uncolored plates and on superior paper by sending $1.00 to the editor of this Journal.

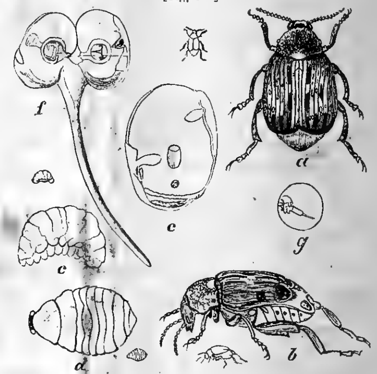
ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent, are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain, whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

Scorpion in Kansas—*K. Kelsey, Ottawa, Kans.*—The animal you send is a Scorpion—the *Buthus carolinianus* of Beauvois—mentioned by Dr. G. Lincecum, on page 203 of the first volume of the *American Naturalist*, as a Texan species. You will find, by referring to page 59 of our first volume [Vol. 1, ¶. 1), that it often occurs in Missouri, but we were not aware before that it occurred in Kansas.

The Grain Bruchus of Europe just Imported—*A. S. Fuller, Ridgewood, N. J.*—The weevils which were found in some pods presented to the Farmers' Club,

[Fig. 85*]



Colors—Black, gray and white.

are evidently the common European Grain Bruchus (*Bruchus granarius*). You say that the gentleman who presented the pods, gathered them from a tree in Switzerland. It were very much to be wished that he knew the kind of tree, and that he had had the good sense to examine the pods before he brought them to this country. The seed-pod which you sent along with the beetles, looked to us very much like that of an Everlasting pea, but as it grew on a tree, it belongs in all probability to some species of Laburnum. The weevil was entirely new to us, and does not agree with any of the described N. A. species, and Dr. Geo. H. Horn, of Philadelphia (who now has charge of Dr. LeConte's large collection of beetles), to whom we sent a specimen, pronounced it new to the collections there. Concluding, therefore, that it was introduced from Europe, we had no difficulty, on comparing it with European descriptions, in recognizing it as their common Grain Bruchus.

Now this weevil is a most unmitigated nuisance in Europe, where it is a very general feeder; and according to the facts set forth in the article in our present number, entitled "Imported Insects and Native American Insects," it will prove even more injurious in this country, if it once gets foot-hold. You will therefore see the need of immediate action in the matter, in order that by a little vigilance we may stamp it out of our midst. You may rest assured that we so effectually put an end to those which were received here, that they will never more see the light of day. We advise you to call the attention of the Farmers' Club to the article on Native and Imported Insects already referred to, and to the "Report of the Committee on Entomology," which elsewhere appears in this number. The Club should insist on the total destruction of every seed of this kind that has been distributed, for unless such action is taken, that body may do more harm in the introduction of one such insect, than it can do good in the next twenty years. When the Swedish traveller,

* EXPLANATION OF FIGURE.—*a*, perfect beetle, back view; *b*, same, side view; *c*, larva; *d*, pupa—all highly magnified, the accompanying outlines showing the natural size; *e* and *f*, infested beans; *g*, an infested pea.

Kalm, discovered specimens of our own indigenous "Pea-bug" (*Bruchus pisi*) just disclosed in a parcel of peas which he had taken with him from America, no wonder he was thrown into such a trepidation, lest he should be the instrument of introducing so fatal an evil into his beloved Sweden; and the N. Y. Farmers' Club may expect the anathemas of the farmers of the country, if, with the vulgar, they deem this Bug matter beneath their notice.

In order that our readers may become well acquainted with the appearance of this weevil, we present (Fig. 85) figures of its different states, both magnified and natural size, as found in Curtis's Farm Insects, and quote from the same author the following account of its habits:

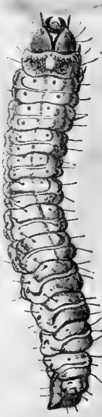
"This species, which is everywhere abundant as early as February on the furze when it is in blossom, inhabiting also the flowers of various other plants in the beetle state, as the Rhubarb, Meadow-sweet (*Spiræa ulmaria*), etc., is a most destructive insect in our pea and bean fields, the larvæ feeding in the seeds and sometimes destroying more than half the crop. They are exceedingly abundant in some parts of Kent, where they often swarm at the end of May, and are occasionally found as late as August; indeed I killed one in November, imported with Russian beans, which had been alive since the end of September. It attempted to fly away in October; it then became torpid, but on warming it by a fire in the middle of November, it was as lively and active as in the height of summer, and I dare say would have lived through the winter.

"It is said that the female beetles select the finest peas to deposit their eggs in, and sometimes they infest crops to such an extent that they are eaten up by them, little more than the husk being left. The various kinds of beans are equally subject to their inroads; besides the long-pods I have alluded to, I have had broad Windsor beans sent to me containing these *Bruchi;* and Mr. C. Parsons transmitted me some horse-beans in the beginning of August, 1842, which were entirely destroyed by them. Mr. F. J. Graham showed me some seed-beans which were inoculated by these beetles to a great extent, and some of them were alive in the seeds; yet to any one ignorant of the economy of this pest, there would not appear the slightest external indication of their operations. I also received from a gentleman residing in Norfolk a sample of seed-beans from Russia, for winter sowing, a large proportion of which was perforated by this *Bruchus*.

"It has already been intimated that as the beetles generally leave the germ uninjured, the vitality of infested seeds is not destroyed. I doubt, however, if they produce strong healthy plants; and from my own experience I have no doubt if peas and beans be sown containing the *Bruchus granarius*, that the beetles will hatch in the ground, and thus the cultivator will entail upon himself a succession of diseased pea and bean crops. Now to avoid this loss, the seed should be examined before sowing, when to an experienced eye the presence of these beetles will be discernible, where to a common observer they would appear sound and good. The maggots, when arrived at their full size, gnaw a circular hole to the husk or skin of the seed, whether pea or bean, and even cut round the inner surface which covers the aperture, so that a slight pressure from within will force this lid off; these spots are of a different color to the rest of the seed, generally having a less opaque appearance, and often are of a duller tint; on picking off this little lid, a cavity will be found beneath containing either a maggot, pupa, or beetle."

Locust Borer—*J. M. Shaffer, Fairfield, Iowa.*—

[Fig. 86.]



Color—Yellow.

The large yellow worms, variegated with light brown, which Mr. Jas. Eckert found imbedded in the common Black Locust, are the larvæ of the Locust Carpenter Moth (*Xyleutus robiniæ*, Peck), an insect which has long been known to attack the Black Locust, and which has materially helped the more common borer, which is the larva of a beetle (*Clytus robiniæ*) in killing our Locust groves throughout the country. We represent herewith (Fig. 86) for the benefit of the general subscriber, one of the female worms. It is not often that the sex of an insect can be foretold in the larva state, but there is such disparagement in size between the male and female of this Carpenter Moth that it is easy to do so in this instance, the male worm being scarcely half as large as our figure. They spin their cocoons within the tree in the early part of the spring, and in time change to chrysalids (Fig. 87, ♀). In the moth state, the difference between the sexes is not confined to size, for while the male (Fig. 88) is but two-thirds as large as the female, he is characterized further by being of a much darker gray, and by having the hind wings of an ochre-yellow, while she has none of that color about her, (See Fig. 89.) The moths issue from the trees during the last days of June and first days of July. Both sexes are quite difficult of detection, as they delight to rest on old rough trees, their closed wings much resembling a piece of rough bark. The worms are found more frequently in old trees than young, and we believe it is for the very reason that the older trees afford the moths greater protection. The ovipositor of the female is extensile, the better enabling her to deposit her eggs in the deep notches, and dark bottoms

[Fig. 87.]

Color—Light brown.

[Fig. 88.]

♂

Color—Dark gray and ochre-yellow.

of crevices. The eggs there elude detection, being of a dark-brown, inclining to purple. The young worms which hatch from them are also dark-brown, with large heads; they are active and commence spinning as soon as they are born. Luckily, this insect seldom becomes numerous enough to cause serious alarm, as to combat it on a large scale would be difficult. Special trees may

[Fig. 89.]

♀

Color—Light gray.

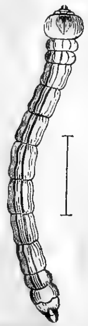
be saved from its attacks by an application of soft soap as far up the trunk as possible, about the end of June, as it will prevent the moths depositing. At this time also, the moths may be caught and destroyed from off trees already infested, by visiting such trees early in the morning, for the moths are then quite sluggish, having emerged from the tree during the night, leaving their empty chrysalis skins protruding half way out of the holes. This insect attacks the Oak as well as the Black Locust, and, judging from specimens which we received a year ago from Mr. J. Huggins, of Woodburn, Ills., it also infests the Crab-apple. According to Dr. Fitch, it is more common in Oak in the Eastern States than in Locust; but we have found it more partial to the Locust in the West.

Eggs of Snowy Tree Cricket on Raspberry Canes—*J. B. Root, Rockford, Ills.*—The straight rows of punctures on your Doolittle Black-Cap Raspberry canes, the punctures contiguous to each other, with an egg placed slantingly across the pith leading from each, are made by the Snowy Tree Cricket (*Œcanthus niveus*, AMERICAN ENTOMOLOGIST, Vol. I, Figs. 38 and 39). Though these eggs may be mistaken at first for worms by the unskilled, yet no entomologist would ever mistake them for such. An egg—no matter how narrow or long it may be—can always be distinguished by its lacking entirely those articulations which are so characteristic of all insect larvæ, and of most other worms. The cane will be very apt to die above these deposits, and to prevent the increase of the insect, the infested canes should all be cut off and burned before spring.

Spotted Rove-beetle—*J. H., Woodburn, Ills.*—The large gray insect with short wing-covers, which seemed to be very anxious to cover itself with filth, is the Spotted Rove-beetle (*Staphilinus maculosus*, Grv.) The Rove-beetles are voracious creatures, preying on decaying animal and vegetable matters. They are also found abundantly under heaps of putrescent plants, and, acting in the capacity of Scavengers, must be considered beneficial.

Raspberry Gouty Gall—*Chas. Carpenter, Kelly's Island, Ohio.*—The swollen, gouty appearance of your raspberry and blackberry vines is caused by the Red-necked Agrilus (*Agrilus ruficollis*). You will find an illustrated article on the subject in the present number, under the same caption that heads this paragraph. We had never before found fresh and living larvæ, as the galls which we had heretofore received were too dry when they reached us. But your galls came very opportunely, for we found three full-sized living specimens within them, and are thus enabled to give a truer figure (Fig. 90) than that given on page 103, and to add the following description for our scientific friends:

[Fig. 90.]



Color—Whitish.

AGRILUS RUFICOLLIS.—*Larva*—Color pale-yellow. Length 0.55 inch. Diameter 0.05 inch. Somewhat flattened, especially at sides, the width nearly twice as great as depth. A rufous vesicular dorsal line. Head brown; jaws black. Joint 1 about ¼ wider than 2, and having a somewhat horny yellow patch above, shaped something like a kite; joints 2 and 3 = 1 in length; 4 as long as 2 and 3 together; 5—10 sub-equal and longer than four; 11 half as long as 10; 12 swollen, somewhat horny below, and ending in two thorns, each with three blunt teeth on the inner edge.

As little or no fruit matures above these galls, which are often quite near the ground, it is very likely, as you suggest, that this cause of unfruitfulness is not suspected by the casual observer. All affected canes should be cut off below the galls and burned before spring.

Parasitic Cocoons—*G. C. Brackett, Lawrence, Kans.*—The little masses of light brown cocoons, all soldered together (Fig. 91) which you find lying on the ground under your apple trees, are the cocoons of a little parasitic Ichneumon fly. The fly comes very near the genus *Microgaster*, but lacks the areolet, and will probably have to form a new genus; but for the present all that you are interested in knowing is, perhaps, that it is beneficial. It doubtless infests some worm which feeds on the leaves of your apple trees, and as Dr. Warder has sent us some of the same cocoons, taken likewise from your orchard, it seems to be quite common with you. It would interest us to know upon what particular worm it feeds.

[Fig. 91.]

b *a*

Color—Light brown.

The Pigeon Tremex in Apple—*Jonathan Huggins, Woodburn, Ills.*—The large four-winged fly about 1½ inch in length, with a black and rust-colored cylindrical body of the size of a common lead-pencil, and with a stout piercer at extremity, is a ♀ Pigeon Tremex (*Tremex columba*, Linn.) Your finding her piercing an apple tree is a new fact, for though this insect is well known to attack oak and elm trees, it has not heretofore been recorded as occurring in apple trees. The Lunate Rhysa—that large Ichneumon fly figured on the left of our cover—seeks the larva of the Tremex in its hidden retreat, and by means of her long ovipositor, deposits an egg in its body, which hatches out and destroys the wood-borer.

Yours ever

Benj. D. Walsh

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CHARLES V. RILEY, EDITOR.

MR. WALSH'S PORTRAIT.

Nothing perpetuates so well the memory of a departed friend as a good and life-like portrait. We may do our best to pen a truthful sketch of a man's life, and yet fall far short of conveying a just and correct impression to those who never saw him in the flesh. A good portrait, however—phrenology or no phrenology—is at once the mirror of a man's character, and in a great measure his biography. In it the dead live again to near and dear ones, and by it future generations will judge a man more correctly. The editor takes great pleasure, therefore, in presenting the accompanying portrait of Mr. Walsh, and feels that it is the best tribute he has the power of paying to his departed associate.

We are much pleased with the plate, for it is a good likeness. In it the wonted humor yet twinkles from those eyes which are now closed forever in the quiet rest of the grave, and the facetious smile yet lurks around those lips which are nevermore to utter word again!

As a fitting accompaniment to the portrait, we publish the following resolutions, from among several others which we have received:

"*Proceedings of the London Branch of the Entomological Society of Canada, at a meeting held December 3, 1869.*

"The following resolutions were unanimously adopted:

"*Resolved*, That we, the members of this society, have learned with deep regret of the sudden death of Benj. D. Walsh, Esq., State Entomologist of Illinois. We have long admired his zeal and earnestness in endeavoring to advance entomological science, and we feel that our favorite study has lost in him one of its staunchest supporters and advocates, and those of us who had the privilege of his personal acquaintance, a warm friend. We tender our heartfelt sympathies to his bereaved widow and friends, and assure them that his labor of love, manifest in his many valuable contributions to entomological literature, will ever be fondly cherished in our memories.

"*Resolved*, That the Secretary be instructed to transmit copies of the above resolution to the widow of the late B. D. Walsh, and also to the editors of the *American Entomologist* and *Canadian Entomologist*, with a request to insert the same in their next issues.

"G. M. INNES, President.

"EDMUND BAYNES REED, Sec'y and Treas."

"*Extract from the Minutes of the Meeting of the American Entomological Society, held January 10, 1870.*

"*Resolved*, That this Society has heard with the deepest regret of the great loss sustained by the science of entomology, in the death of our late member, Benj. D. Walsh of Rock Island, State Entomologist of Illinois.

"*Resolved*, That this Society hereby testifies to the great worth and scientific attainments of the deceased, whose pen was ever ready to defend, uphold and spread abroad the benefits derived from the popular study and knowledge of entomological science.

"*Resolved*, That the Corresponding Secretary be directed to transmit to the widow of the deceased a copy of these resolutions, as a slight expression of the sympathy of the Society with her in this great affliction."

"*Preamble and Resolution passed by the Illinois State Horticultural Society.*

"WHEREAS, We have learned with deep regret of the decease of Benj. D. Walsh, A. M., State Entomologist,

"*Resolved*, That in view of his scientific acquirements, which had secured for him a national reputation, his zeal in investigation, and his practical mode of communicating his discoveries, we consider his death, in the vigor of intellect, as a loss to the public not likely soon to be repaired. ARTHUR BRYANT, Sr.,

"Chairman of Committee."

"*Preamble and Resolutions passed unanimously at the Annual Meeting of the Kansas State Horticultural Society.*

"PREAMBLE: It having pleased God to open the portals of eternity, and take from the earth—the great field of his usefulness—Benjamin D. Walsh, State Entomologist of Illinois and senior editor of the *American Entomologist*, it becomes our sad duty, in reverently bowing to the divine behest, to admit the obligations under which the deceased has placed us, in common with the culturists of the West, by a patient, persevering devotion of a lifetime to the science of entomology as applied to the highest material interests of this Association and the commonwealth of Kansas; therefore, be it

"*Resolved*, That we hereby formally express the sorrow inseparable from our great loss in the death of Mr. Walsh, in the midst of his great and increasing usefulness.

"*Resolved*, That this preamble and resolutions be spread upon the records of this Society, and that an authenticated copy thereof be transmitted to the widow of the deceased, and to C. V. Riley, Esq., surviving editor of the *American Entomologist*.

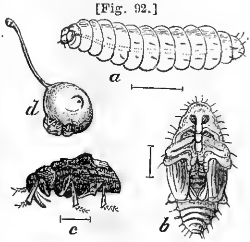
"G. C. BRACKETT, Secretary."

THE PLUM CURCULIO.

(*Conotrachelus nenuphar*, Herbst.)

A PAPER READ BY THE EDITOR BEFORE THE ILLINOIS STATE HORTICULTURAL SOCIETY AT ITS FOURTEENTH ANNUAL MEETING.

[Fig. 92.]



Colors—(*a* and *b*) whitish; (*c*) brown, black and clay-yellow.

LADIES AND GENTLEMEN: You have invited me to read an essay on the Plum Curculio. I accepted the invitation with the intention of preparing an exhaustive paper on the subject. But the sudden death of my esteemed associate and your State Entomologist, the late Benj. D. Walsh, so completely upset my arrangements, and so increased my labors, that I have found time only to substitute instead the following hasty notes.

So much has been written on the habits of this one little insect, and on the best means of protecting our fruits from its injurious work, that one almost tires of repeating those established facts in its history which, at first thought, it strikes one that all interested should know. But this is a bustling, shifting, progressive world, and there are yet some mooted points to be settled in the natural history of our Curculio.

When an experienced man is taken from our midst, the fund of wisdom and the store of knowledge which he had accumulated during a long and busy life-time, are in a great measure buried with him. His younger followers profit as much as they can by his recorded experience, but they must necessarily go over the same ground which he had been over before. Facts in Nature will consequently have to be repeated for all time to come; but it should be our object to reach beyond the facts already known, to obtain a knowledge of all things as far as the mind is capable of, and to delve still more deeply into hidden truths, so that by observation and perseverance, we may be enabled to read aright the yet unread parts of that great recorded book, which was printed, paged, collated and bound by the fingers of Omnipotence! Besides, there are actually many fruit-growers who do not know a Curculio when they see one. Thus three different correspondents have, during the past summer, requested a description of the little pest, because, as they contended, they were not acquainted with its appearance. And yet one of these gentlemen, as I afterwards ascertained from personal observation, was, at the very time when he penned his question, suffering from injuries caused by the "Little Turk."

In this brief paper on the Curculio I shall, therefore, necessarily have to repeat many of the facts which were published in your own Transactions for 1867, and of those which may be found in the First Annual Report on the Entomology of Missouri.

Established Facts in the History of the Curculio.

In order to lay this question before you in the very clearest light, it will be best to divide this paper into two different parts. In the first part we will give only those facts which are established beyond all peradventure; and in the second part, we will consider only those points upon which opinions differ.

The Plum Curculio, commonly known all over the country as THE CURCULIO, is a small, roughened, warty, brownish beetle, belonging to a very extensive family known as Snout-beetles (CURCULIONIDÆ). It measures about one-fifth of an inch in length, exclusive of the snout, and may be distinguished from all other North American Snout-beetles by having an elongate, knife-edged hump, resembling a piece of black sealing-wax, on the middle of each wing-case, behind which humps there is a broad clay-yellow band, with more or less white in its middle. For the benefit of those who are either fortunate or unfortunate enough not to be acquainted with the gentleman, I have prepared the above side sketch, which will give at a glance its true form, and obviate the necessity of further description and waste of time. (Fig. 92, c.)

This is the perfect or imago form of the Curculio; and it is in this hard, shelly, beetle state, that the female passes the winter, sheltering under the shingles of houses, under the old bark of both forest and fruit trees, under logs and in rubbish of all kinds. As spring approaches, it awakens from its lethargy, and, if it has slept in the forest, instinctively searches for the nearest orchard. In Central Illinois and in Central Missouri the beetles may be found in the trees during the last half of April, but in the extreme southern part of Illinois they appear about two weeks earlier, while in the extreme northern part of the same State they are fully two weeks later. Thus, in the single

State of Illinois, there is a difference of about one month in the time of the Curculio's first appearance on your fruit trees; and I hardly need remind you that the time will vary with the forwardness or lateness of the season.

As we shall see from the sequel, it is very important that we know just when first to expect Mrs. Turk, and I therefore lay it down as a rule, applicable to any latitude, that she first commences to puncture peaches when they are of the size of small marbles or of hazel-nuts, though she may be found on your trees as soon as they are in blossom. To prevent confusion I will use the word "peach," not that her work is confined to this fruit, for, as we shall presently see, she is not so particular in her tastes, but because the peach is more extensively grown in your State than are any of the other large kinds of stone-fruit.

Alighting, then, on a small peach, she takes a strong hold of it (Fig. 92, *d*), and with the minute jaws at the end of her snout, makes a small cut just through the skin of the fruit. She then runs the snout slantingly under the skin, to the depth of one-sixteenth of an inch, and moves it back and forth until the cavity is large enough to receive the egg it is to retain. Then she turns around and drops an egg into the mouth of the cavity, and after this is accomplished, she resumes her first position, and by means of her snout pushes the egg to the end of the passage, and afterwards deliberately cuts the crescent in front of the hole, so as to undermine the egg and leave it in a sort of flap. The whole operation requires about five minutes, and her object in cutting the crescent is evidently to deaden the flap, so as to prevent the growing fruit from crushing the egg.

Now that she has completed this task, and has gone off to perform a similar operation on some other fruit, let us from day to day watch the egg which we have just seen deposited, and learn in what manner it develops into a Curculio like the parent which produced it—remembering that the life and habits of this one individual are illustrative of those of every Plum Curculio that ever had, or that ever will have, an existence.

We shall find that the egg is oval and of a pearly-white color. Should the weather be warm and genial, this egg will hatch in from four to five days, but if cold and unpleasant the hatching will not take place for a week or even longer. Eventually, however, there hatches from the egg a soft, tiny, footless grub with a horny head, and this grub immediately commences to feed upon the green flesh of the fruit, boring a tortuous path as it proceeds. It riots in the fruit—working by preference around the stone—for from three to five weeks, the period varying, as I have amply proved, according to various controlling influences.

The fruit containing this grub does not, in the majority of instances, mature, but falls prematurely to the ground, generally before the grub is quite full grown. I have known fruit to lie on the ground for upwards of two weeks before the grub left, and have found as many as five grubs in a single peach which had been on the ground for several days. When the grub has once become full grown, however, it forsakes the fruit which it has ruined, and burrows from four to six inches in the ground. At this time it is of a glassy yellowish-white color, though it usually partakes of the color of the fruit-flesh on which it was feeding. It is about two-fifths of an inch long, with the head light brown; there is a lighter line running along each side of its body, with a row of minute black bristles below, and a less distinct one above it, while the stomach is rust-red, or blackish. The full grown larva presents, in fact, the appearance of Figure 92, *a*.

In the ground, by turning round and round, it compresses the earth on all sides until it has formed a smooth oval cavity. Within this cavity, in the course of a few days, it assumes the pupa form, of which Figure 92, *b*, will afford a good idea.

After remaining in the ground in this state for just about three weeks, it becomes a beetle, which, though soft and uniformly reddish at first, soon assumes its natural colors; and, when its several parts are sufficiently hardened, works through the soil to the light of day.

So much for the natural history of the "Little Turk." Now let us mention a few other facts which it becomes us as fruit-growers to know.

The Curculio when alarmed, like very many other insects, and especially such as belong to the same great Order of Beetles (*Coleoptera*), folds up its legs close to the body, turns under its snout into a groove which receives it, and drops to the ground. In doing this it feigns death, so as to escape from threatened danger, and does in reality very greatly resemble a dried fruit bud. It attacks, either for purposes of propagation or for food, the Nectarine, Plum, Apricot, Peach, Cherry, Apple, Pear and Quince, preferring them in the order of their naming.

It is always most numerous in the early part of the season on the outside of those orchards that are surrounded with timber. It is also more numerous in timbered regions than on the prairie.

It *can* fly and *does* fly, especially during the heat of the day; so cotton bandages around the trunk, and all like contrivances, are worse than useless.

It prefers smooth-skinned to rough-skinned stone-fruit.

The Miner plum, otherwise known as the Hinckley plum, Isabel plum, Gilett plum, Townsend plum, Robinson plum; and other varieties of that wild species known as the Chickasaw plum (*Prunus chicasa*), are less liable to its attacks than other kinds.

Both the male and female puncture the fruit for food, by gouging hemispherical holes; but the female alone makes the crescent-mark above described.

Scarcely any eggs are deposited after the pit of the fruit has become hard.

The cherry when infested remains on the tree, and the preventive measures that may be applied to other fruits will consequently not hold good with this.

The larva cannot well undergo its transformations in earth which is dry or baked, and severe drouths are consequently prejudicial to its increase.

It often matures in apples and pears, especially in early varieties, but in the great majority of instances the egg either fails to hatch or the young larva perishes in a few days after hatching.

Many other facts might be cited, but in the foregoing remarks I have confined myself to that which I know, from ample personal experience, to be the truth and nothing but the truth.

Artificial Remedies.

Now, gentlemen, it must be clear to you that, as practical men, this is all you need to know to enable you to fight and conquer this evil. Those mooted points which we shall presently consider are of great interest to the naturalist and to the scientific man, and although I do not quite agree with Dr. Trimble, that the hybernation of the Curculio, for instance, is practically of no consequence, yet the settlement of these questions is not necessary to the carrying on of a successful warfare. We need not necessarily understand the morphology of a plant in order to make it grow; neither is it always necessary to penetrate into all the details of an insect's history in order to circumvent its injuries. You can fight Curculio without being a thorough Entomologist. The remedies are few. They consist of prevention, by destroying the fallen fruit which contains the grub, and by jarring down and catching and killing the beetles. There are a variety of means which can be employed for destroying the grubs which fall with the fruit before they enter the ground. It can be done either by hand or by stock. Hogs and poultry are of undoubted use for this purpose. In the article entitled "Hogs vs. Bugs," in the first number of the AMERICAN ENTOMOLOGIST, abundant proof in support of this fact may be found, and I have, since that was published, obtained much additional proof of a similar nature, and am convinced that our friend Dr. Hull underestimates the value of these auxiliaries. Of course, the first year they are used they do not in the least decrease the number of beetles, but wherever they CAN be used, a most beneficial effect will be noticed the second year, and every year afterwards. As stated in the article referred to, the practical difficulties in the way of carrying out the system of subduing fruit-boring insects by hog-power are: 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. 3rd, The necessity of giving up the 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 which 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.

The jarring process may be carried on in various ways, accordant with the extent of the orchard or the character of the trees to be jarred —always bearing in mind that a sudden jar, rather than a severe shake or knock, is necessary. There is no more thorough and expeditious way, however, than by means of Dr. Hull's Curculio-catcher. Every member of this Society is probably familiar with the appearance of this machine; but, believing that a description of it has never been published in your Transactions, I will give one in the Doctor's own words.

[A full and illustrated description of this machine will be found on page 220 of our first volume.]

I have noticed that where this Curculio-catcher has been constantly used the trees have suffered serious injury from bruising, and would suggest that, by driving a spike (one with a shoulder to it might be manufactured for this express purpose) into each tree at the proper height, this trouble may be easily overcome. This is more especially necessary with old and large trees, which do not vibrate so easily as do younger ones. Let us hope that the day is not far distant, when this machine, or some improvement on it, will be in such general demand as to insure its manufacture by some of our implement dealers. It should be considered by all who wish to grow stone-fruit, as a horticultural implement, second only in usefulness to the plow.

Before leaving this subject of remedies I will say that much can be done in a small way by crushing the egg with the finger-nail, or by cleanly cutting out the newly hatched larva. It will also suggest itself that, in planting an orchard with timber surrounding, the less valuable varieties should be planted on the outside, and as the little rascals congregate on them from the neighboring woods in the early part of the season, they should be fought persistently. It will also pay to thin out all fruit that is known to contain grubs, and that is within easy reach; while, wherever it is practicable, all rubbish and under-brush should be burnt during the winter.

An Appeal.

The burden of this essay is to impress upon you the utter futility of all other pretended remedies. One of our most eminent Eastern horticulturists has honored you, gentlemen, by calling you the most philosophical set of fruit-growers in the land. I want you to deserve this honor by showing your good sense in this Curculio matter. Tolerate no other methods of fighting this foe than the two above named. I am thoroughly satisfied that there is no other remedy, and the sooner we are all convinced of it the better. For over half a century the agricultural and horticultural press has been flooded with wondrous remedies, and yet, aside from the two methods already indicated, there are but three out of the whole catalogue which have even the appearance of common sense, and these are altogether impracticable in an orchard of average extent.

Lazy men may croak; they may declare that the days of profitable fruit-growing are gone by, that fruit-growers are going to perdition, and that the Curculio cannot be conquered! But sensible men know better. Witness the commotion which one of the thousand proposed Curculio remedies recently produced among the members of the lately organized St. Louis Farmer's Club. A gentleman claims to have a remedy, which is, however, a secret, as he wishes to make money with it. Forthwith an exciting discussion takes place, and Col. Colman offers a million dollars for a remedy—a million dollars for a remedy for the Curculio! Now, what did these gentlemen mean by a remedy? If they had ever read their State Entomological Report they would have found one there given. But no: they look for some panacea, some placebo, some Aaron's rod wherewith to smite the hosts of the Curculio throughout the land with a single wave of the hand! They might as well try to produce fruit without first planting and cultivating the tree which is to bear it, as to try to conquer the Curculio by any other but the rational means we have set forth. We do not now live in the age of miracles; and if a man undertakes to feed five thousand persons on five loaves and two small fishes, he will fail most ignominiously in the undertaking. Just so long as we look for remedies of a miraculous nature, just so long will the Curculio retain the upper hand; but as soon as we abjure all washes, fumes and patent applications to the tree, of whatever sort, and confine ourselves to killing this little foe, either in the grub or perfect state, then shall we be able to raise fruit free from its injuries. Our experiments should all tend in the direction of improving the methods of destroying the grub, and of jarring down and killing the beetle. In fact, the jarring of the trees and killing of the little rascals must henceforth be considered as part and parcel of stone-fruit culture. You may argue, and with reason, that, with the utmost diligence, you can never succeed in entirely subduing this enemy, for it will breed in the forest, will in some few cases perfect in the fruit that hangs on the tree, and will come in upon you from your neighbors. Granted, in like manner, you may cultivate your land year after year, so that not a single weed shall ever go to seed upon it, and yet you can never entirely subdue the weeds. But would you therefore cease to cultivate, and let the weeds overrun you? It is useless to seek for good without evil, and the man who wishes to raise stone-fruit without fighting the Curculio ought to read Henry Ward Beecher's advice to him who wanted an easy place.

The more united the effort to fight Curculio, the less work will there be for each; but even where one determined man is surrounded by negligent and slovenly neighbors, he will be rewarded for his efforts. If this Society could only devise some means to insure concerted action in this respect among its own members, a great point would be gained. The negligent fruit-grower cannot be brought to duty by legislative means, but might not this Society, by resolution, make it obligatory on its members to fight Curculio, if they grow stone-fruit, by voting itself plenary power to fine such members as prove recusant? At all events, as we were advised last winter by Mr. L. C. Francis, in his excellent essay on the Plum, let us fight it out on the jarring line, if it takes all summer, and it WILL take all summer, for the trees should be jarred regularly, from the time the fruit is set until it is ripe.

I have little patience with those persons who claim that fruit cannot be protected from the Curculio by the jarring process; or that it will not pay to carry on the business when this work is necessary. As a general rule, such persons were never guilty of jarring a tree, or, if they were, they did not pursue the process systematically. All who properly pursue it for a number of years are successful. Judge Brown, Dr. Hull, and many other members of this Society, can attest the truth of this assertion. Dr. Trimble, of New Jersey, never once failed to obtain a good crop of plums, apricots, and nectarines for ten successive years, though his more neglectful neighbors could not succeed. Ellwanger & Barry, of Rochester, N. Y., J. J. Thomas, of Union Springs, N. Y., and a host of prominent Eastern fruit-growers whom I might mention, all testify to its efficacy and success, when followed up year by year, and as to the cost, Mr. Parker Earle, of South Pass, in an able article in a recent number of the *Rural New Yorker*, demonstrated by the actual figures of those who had kept an exact account of the labor used, that it costs a trifle less than *eight cents per tree* to run one of Dr. Hull's machines during the Curculio season! No one will claim that the crop is not worth saving at ten times such a cost!

Natural Remedies.

Dr. Trimble has lately communicated to me the fact that he has discovered a true parasite upon the larva of the Curculio. The sooner it makes its appearance in the West the better, for no such parasite has ever been detected here yet. It was well known that ants destroyed the grubs as they left the fruit to enter the ground, but up to 1868, no other cannibals were known to attack it. In the summer of that year, my late lamented associate, Mr. Walsh, discovered several which habitually prey upon it, namely, the larva of the Pennsylvania Soldier-beetle (*Chauliognathus pennsylvanicus*, DeGeer), that of an undetermined species of Lace-wing Fly (*Chrysopa*), that of an unknown Ground-beetle (probably *Harpalus pennsylvanicus*, De Geer), and the Subangular Ground-beetle (*Aspidiglossa subangulata*, Chaud.) Those who wish full descriptions, with figures, of these Curculio enemies, will find them in the October (1868) number of the AMERICAN ENTOMOLOGIST. The Pennsylvania Soldier-beetle is evidently the most effectual of the four, for its larva is frequently met with; while the beetle itself, with its yellow jacket and two broad black spots near the tail, is very abundant during the months of September and October, on many of our composite flowers, and especially on the golden-rods, spireas, bigonias, privets, and on carrot blossoms. It does no harm to the flowers, being content with the pollen which they afford, and it should never be ruthlessly destroyed.

But I have this year discovered an insect friend, which, though far more insignificant in appearance, is yet more useful to us in checking the increase of the Curculio than are all the others put together. It is in the shape of a yellow species of *Thrips*, of microscopic dimensions, the business of whose life seems to be to hunt up and devour the Curculio egg as soon as deposited. I had often wondered why so many Curculio eggs failed to hatch, and was gratified last May to find the cause. A description of this *Thrips* would not edify you, and it suffices to state that the word *Thrips* is used in the Entomological sense, and not in the sense which many horticulturists use it, as in speaking, for instance, of the Leaf-hopper of the vine. The illustration which I have prepared will give you an idea of the contour of these little animals. The species in question is yellow, and scarcely measures one-twentieth of an inch. Thus far I have only noticed it in two orchards near Sulphur Springs, Mo., and cannot yet tell to what extent it occurs elsewhere; yet who knows but this liliputian little friend may, in the course of a few years, rout the ubiquitous "Turk," by attacking him in his most vulnerable point, just in the same manner that the Ladybirds routed the Colorado Potato Bug in many sections, by devouring its eggs; or that the minute Acarus or Mite, described by Dr. Shimer as *Acarus mali*, and first noticed two years ago, has routed the Oyster-shell Bark-louse in many orchards? Verily, Nature's ways are so varied—so complicated, and the phases of animal life are so intricate—so protean, that this much desired result may yet be consummated. Only this year, a worm which I have called the Pickle-worm, and which was never before known to cut up such capers, has everywhere penetrated our melons and our cucumbers, and presents its ghastly self even in our choicest pickles. The "Struggle for Life" causes many a vacillation in the proportion of an insect and its parasite—the cannibal and its prey—and the Little Turk may yet find his match in this apparently insignificant *Thrips*.

Mooted Points.

We will now briefly touch upon a few points on which there is difference of opinion, and which will, it is to be hoped, elicit discussion, and draw out the opinions and experience of those present.

There is conflicting evidence from different authors, as to whether the Curculio is single or double brooded each year, and as to whether it hybernates principally in the perfect beetle state, above ground, or in the preparatory state, below ground; the very earliest accounts we have of the Plum Curculio, in this country, differing on these points. Thus, it was believed by Dr. James Tilton, of Wilmington, Delaware, who wrote at the very beginning of the present century, and by Dr. Joel Burnett, of Southborough, and M. H. Simpson, of Saxonville, Massachusetts, who both wrote interesting articles on the subject, about fifty years afterwards; that it passed the winter in the larval or grub state, under ground, and Harris seems to have held the same opinion. But Dr. E. Sanborn, of Andover, Massachusetts, in some interesting articles published in 1849 and 1850, gave as his conviction that it hybernates in the beetle state above ground. Dr. Fitch, of New York, came to the conclusion that it is two-brooded, the second brood wintering in the larva state in the twigs of pear trees; while Dr. Trimble, of New Jersey, who devoted the greater part of a large and expensive work to its consideration, decided that it is single-brooded, and that it hybernates in the beetle from above ground, and he recently informed me that he still holds to the same opinion. Since the writings of Harris and Fitch, and since the publication of Dr. Trimble's work there have been other papers published on the subject. The first of these was a tolerably exhaustive article, by Mr. Walsh, which appeared in No. 7 of the 2nd Volume of the *Practical Entomologist*, in which he takes the grounds that the Curculio is single-brooded; though subsequently, on page 67 of his First Annual Report, he came to the very different conclusion that it was double-brooded. In the summer of 1867 I spent between two and three weeks in Southern Illinois, during the height of the Curculio season, and closely watched its manoeuverings. From the fact that there was a short period about the middle of July, when scarcely any could be caught from the trees, and that after a warm shower they were quite numerous, having evidently just come out of the ground, I concluded that the insect was double-brooded, and communicated to the *Prairie Farmer* of July 27th, 1867, the passage to that effect, under the signature of "V," which is quoted by Mr. Walsh (Rep., p. 67), as corroborative of its two-brooded character. Subsequent calculation induced me to change my mind, and I afterwards gave it as my opinion, on page 113 of the Transactions of this Society for 1867, that there was but one main brood during the year, and that where a second generation was produced it was the exception. My reasons for this opinion may be found detailed in the Missouri Entomological Report. Finally, our friend, Dr. Hull, of Alton, Illinois, who has had vast personal experience with this insect, read a most valuable essay on the subject, before the meeting of the Alton (Ill.) Horticultural Society of March, 1868, in which he evidently concludes it is single-brooded, and that it passes the winter, for the most part, in the preparatory state, under ground; and judging from an article recently published by him in the *Prairie Farmer*, he yet inclines to the same belief.

Now, why is it that persons who, it must be admitted, were all capable of correct observation, have differed so much on these most interesting points in the economy of our Plum Curculio? Is there any explanation of these contradictory statements? I think there is, and that the great difficulty in the study of this, as well as of many other insects, lies in the fact that we are all too apt to generalize. We are too apt to draw distinct lines, and to create rules which never existed in Nature—to suppose that if a few insects which we chance to watch are not single-brooded, therefore the species must of necessity be double-brooded. We forget that Curculios are not all hatched in one day, and, from analogy, are very apt to underrate the duration of the life of the Curculio in the perfect state. Besides, what was the exception one year may become the rule the year following. In breeding butterflies and moths, individuals hatched from one and the same batch of eggs on the same day, will frequently, some of them, perfect themselves and issue in the fall, while others will pass the winter in the imperfect state, and not issue till spring; and in the case of a prangling green worm that is found on raspberry leaves, and that passes the winter under ground, and develops into a four-winged fly (*Selandria rubi*, Harris) in the spring, I have known a difference of three months to occur between the issuing of the first and last individuals of the same brood, all the larvæ of which had entered the ground within three days. Far be it from me to pronounce that there is no such thing as rule in Nature, and that we cannot, therefore, generalize; I simply assert that we frequently draw our lines too rigidly, and endeavor to make the facts come within them, instead of loosening and allowing them to encompass the facts.

It was my intention to have thoroughly and forever settled these disputed questions the past summer, but owing to a lengthy sickness of Mr. Walsh, I was overwhelmed with other matters, at the very season in which the proper experiments could alone be made. Such observations as were made, however, only confirm me in my previous opinion, that it is single-brooded as a rule; but, in justice to Mr. Walsh I will say, that to the day of his death he held the contrary opinion of its being double-brooded. It was on account of this difference of opinion between us, that we could never editorially touch upon the point in the columns of the AMERICAN ENTOMOLOGIST; though we had each of us decided to come to an agreement, in accordance with the facts to be elicited in discussion at this meeting. Alas! how inscrutable are the ways of Providence! He has been taken from our midst, and we shall nevermore listen to his bold, outspoken voice.

Dr. Trimble writes: "I have a friend, an accomplished ornithologist (companion of Audubon), with whom I frequently converse. Once, speaking about quails, I spoke of their having more than one brood a year. He said, 'did you ever see a brood of quails, whether full-grown or half-grown, without the old birds with them?' In thinking it over, I cannot remember that I ever did. The inference follows: the early broods of quails of this year, have the early broods the next year—the late broods this year, the late broods next year. Why not so with Curculios?" On broad principles it may be stated that insects differ from other animals in so far that they do not breed an indefinite number of times in the course of their lives, but that the females perish soon after depositing their first and only batch of eggs. But although a great many insects occupy but a few hours or a few days in laying this batch of eggs, yet many of them require a much longer time. This is eminently the case with our Plum Curculio, and indeed with most of the insects in the same great Order of Beetles to which it belongs; and I know that Curculios which hybernated may be found upon our trees even a few days after the first bred Curculios of the season appear. Again, few persons—even among those skilled in Entomology—are aware of the wonderful influence produced upon insects by climate or by the character of the seasons. To illustrate: the Oblong-winged Catydid (*Phylloptera oblongifolia*, De Geer) in a state of Nature finishes depositing its eggs, and ceases its chirrup by the first of October in the latitude of St. Louis, and yet this very year, by keeping them within doors and feeding them on green apples, I succeeded in keeping several which I had hatched from the egg, alive until the first days of December; and though everything was bleak and bare outside, and the Catydids had been swept off by the early frosts nearly two months before, *yet these continued to deposit up to within three days of their death.* No one with the knowledge of such facts, would for a moment doubt that in certain southerly latitudes, it is possible for the Curculio to be double-brooded, and yet be single-brooded in more northerly regions; for several instances of a similar nature in insect life, might be cited. But that it is single-brooded as far south as the southern part of the State of Illinois, I feel quite satisfied. The Curculios generated from those which wintered over, never lay eggs the same season they are hatched; at least, no one has ever succeeded in making them do so, though the experiment has been tried by Dr. Trimble, Dr. Hull, Judge Brown, and myself. Indeed, all analogy confirms the belief in its one-brooded character, for it is admitted that the Plum Gouger (*Anthonomus prunicida*, Walsh), the Apple Curculio (*Anth. quadrigibbus*, Say), the Pea-weevil (*Bruchus pisi*, Linn.), and many other closely allied species produce but one brood each year, and it is with good reason argued, that if there were two generations of Curculios, late fruit would be covered with their crescents, whereas we know that such is not the case.

As to the hybernation of the Curculio, it is only necessary to state, that I am positive that the beetles survive the winter, for I have frequently found them myself during this season of the year, under the rough bark of both fruit and forest trees, and they have been found in like situations and under the shingles of houses, etc., by several other persons. Dr. Hull, on the contrary, believes that they pass the winter in the preparatory state, and records in so many words, that he has found the larvæ in January at a depth of from fifteen to thirty-six inches, and that in April he has found both larvæ, pupæ and beetles below ground. Now, I have a good deal of faith in the accuracy of the Doctor's observations, and accept these statements as truth, the more willingly because the Four-humped, or Apple Curculio, which attacks our apples quinces and haws, does pass the winter in the larva state under ground. But had he not found the beetle in company with the larvæ and pupæ, I should not so readily have accepted such proof, but, like Oliver Twist, should ask for more; for the larvæ of several species of snout-beetles very much resemble each other, and we are all liable to make mistakes. Individually, I never found Plum Curculio larvæ at a greater depth below ground than six inches, and my efforts to find them in the winter under trees from which infested fruit had fallen during the previous summer, have so far been fruitless.

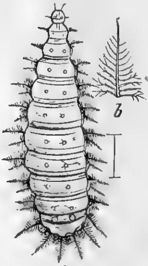
As to whether the Curculio is the cause of the Peach-rot, there can be no question whatever that it is greatly instrumental in spreading this dreaded disease. So much is this the case, that by protecting fruit in such a manner that no insects can get at it, you may in a great measure save it from rotting: and this is an additional reason why trees should be thoroughly jarred and protected from the Curculio. But I yet hold that the puncture cannot possibly be the first cause of Peach-rot. This is sufficiently proved by the facts, that much of the fruit is punctured long before the rotting season commences; that the fruit often arrives at perfect maturity, still containing the grub; that in certain localities, and in favorable seasons, the rot is scarcely known, though the fruit is badly punctured; and, finally, that the crescent of the Curculio often (indeed, in the great majority of instances) heals up entirely, thus precluding the idea of any poisonous effect attending the puncture. It might, with equal reason, be argued that the Grape-rots, the Potato-rot, and all the innumerable other rots are also caused by insects: but as I have already devoted all the time I can spare to this paper, although many interesting facts have not even been alluded to, and as this matter does not properly come within my province, I leave it for the discussion of the more wise and experienced.

LARVÆ IN THE HUMAN BOWELS!!

ONE OF MR. WALSH'S POSTHUMOUS ARTICLES.

On July 5th, 1869, we received from Dr. J. T. Wilson, of Quincy, Ills., over a dozen of the curious fringed larvæ, which we represent considerably magnified in the annexed drawing (Fig. 93). The circumstances under which they were found are detailed in the following extract from Dr. Wilson's letter:—

[Fig. 93.]



Color—Brownish-white

The specimens sent were discharged, along with several hundred others, from the bowels of one of my patients. Five months ago several hundred of the same nondescript, but of much larger size, were discharged from the bowels of the same patient. Having no knowledge of this parasite, I supposed in the first instance that there must have been some mistake about the matter, and therefore treated it with indifference. But on the second occasion, I satisfied myself that they were really evacuated from the intestines. I am fully persuaded that they multiply within the alimentary canal; yet I think that they must have been originally introduced through the mouth. I confess that they are a strange parasite to me, and I find they are equally so to all the medical gentlemen to whom I have shown them. I am very anxious to get all the information upon this subject that I can, and should like to learn all that is at present known about it.

From the structure of these larvæ, it is manifest that they belong to a section of a genus of Two-winged Flies, the Flower-flies (*Anthomyia*), which section was many years ago separated as a distinct genus (*Homalomyia*) by Bouché. The true Flower-flies are named from the habit which the perfect insect has of settling upon flowers; but in the larva state most of them feed upon living vegetable matter, and are usually smooth soft whitish maggots, of an elongate-conical shape, with the head end tapered to a point and the tail end more or less squarely docked. It is to this group that the Imported Onion-maggot Fly (*A. ceparum*), the Imported Cabbage-maggot Fly (*A. brassicæ*), and an apparently indigenous species which we have described and figured as the Seed-corn Flower-fly (*A. zeæ*, Riley),* all of them belong. On the contrary, the larvæ belonging to the other group (*Homalomyia*), instead of feeding upon living vegetā-

* Missouri *Entom. Report*, 1869, pp. 154-5.

tion, wallow in moist decaying matter, whether animal or vegetable; and as in such situations they would be sometimes stifled for want of air, if they breathed through the spiracles or breathing-holes with which all air-breathing insects are supplied, nature has replaced the spiracles by lateral "branchiæ" or gills, by means of which they are enabled, after the fashion of a fish, to extract the air from the fluids that surround them. On referring to our Figure 93, *b*, the reader will see at once the structure of these curious gills, which, however, are by no means peculiar to this genus of Insects, but occur in a great number of larvæ that inhabit the water, for example in those of the Mayflies (*Ephemera* family). These larvæ differ further from those of the true Flower-flies in the tail end being much less conspicuously docked, and in the body being considerably flattened, instead of plumply rounded in the shape of an elongate cone. It was probably in reference to this peculiar flattening of the body of the larva, that Bouché gave to the genus the distinctive name of "Flat-fly" (*Homalomyia*), from two Greek words which bear that meaning.

In the perfect state—as sometimes happens with closely allied genera—the Flat-flies do not differ so materially in their structure and general appearance from the true Flower-flies as do the larvæ belonging respectively to these two genera. Still, as the larval habits of these two genera differ so widely, and as the Flower-flies, in the original and more extensive signification of the term, form a very extensive group—authors having described no less than 65 species of them as found in North America—we must consider the separation of this very large and unwieldy genus into two smaller genera as a judicious step. The minute details wherein the Flat-flies differ from the Flower-flies in the perfect fly state, as they would only fatigue the general reader, will be found in the foot-note.*

We have ourselves bred what Baron Osten Sacken, to whom we have forwarded specimens, thinks is in all probability a true Flat-fly, from larvæ very similar to those figured above, but scarcely more than half as large (*Homalomyia prunivora*). These larvæ we met with in great abundance in a mass of tame plums so much decayed as to become almost semi-fluid. The fly produced from them is only about one-fifth of an inch long; whereas from the largest specimens sent us by Dr. Wilson we might expect to raise a fly at least one-third of an inch long. If, therefore, there was no other reason than this, we might be pretty sure that the two species are distinct. But, as the scientific reader will perceive from the descriptions given in the foot-note, there are other reasons for believing them to belong to separate species of Flat-flies.*

*Through the kindness of Baron Osten Sacken, we learn that *Homalomyia* is characterized by Schiner as having much narrower cheeks than *Anthomyia*, whence the head is more rounded and projects less on the underside of the eyes; and also by the abdomen being less hairy. On comparing a species of *Homalomyia* which, as will be stated hereafter, we have ourselves bred from the larva, with *Anthomyia brassicæ*, these generic distinctions are obvious, both the legs and the abdomen in the latter being rather bristly than hairy.

*HOMALOMYIA WILSONI.—*Larva*—Length when extended 0.37 inch; when contracted 0.28 inch, from 3½ to 5 times as long as wide. Color pale-brown, the sutures brown-black, but only when the body is contracted. *Head* entirely retractile, with its anterior extremity slightly emarginate, and with two minute black hooks on its inferior surface. *Body* 11-jointed, and anal joint large and apparently composed of two confluent joints. The sutures in the contracted specimens forming a strongly elevated carina both above and below, but in those that are elongated forming the usual impressed stria with a subobsolete carina in front of it. Joints 1—3 capable of being much elongated when the head is exserted. Joints 4—10 each with a pair of lateral, transversely-arranged, fleshy, elongate-conical, bipectinate, branchial processes, each process about one-third as long as the body is wide, and the bipectinations, themselves a little sprangling, basally about one-third as long as the processes, and gradually decreasing in length towards the tip of the process. Joints 1—3 with only one such lateral process, which is shorter and shorter as each joint approaches the head; the 11th or large anal joint with six such processes a little longer than any of the rest, placed one behind another at regular distances all round the lateral suture. Joints 1—11 each with a pair of small, transversely-arranged, dorsal, tubercular branchiæ, which are slightly ciliated and about as wide as high on joints 4—10, but on 1—3 are more and more subobsolete, as each joint approaches the head, while on 11 they are twice as high as wide and twice as long as on the preceding joints, and are placed on the anterior half of the joint exactly in range with the two anterior lateral processes. Ventrally joints 4—10 are each furnished with pseudopods, namely, two transverse rows of papillæ; the anterior row nearly attaining the lateral processes, and having its papillæ almost confluent, so as to look like a transverse carina; the posterior row shorter, less distinct, and with papillæ not contiguous. On joint 11 the posterior row of papillæ is replaced by the anus, which forms a very large elongate tubercle with an elongate impressed slit in it, and has a small tubercle on each side of it.—Described from 4 contracted and 5 extended specimens, received, as stated in the text, from Dr. Wilson of Quincy, to whom the species is dedicated.

HOMALOMYIA PRUNIVORA.—*Larva*—Differs from the above only as follows:—1st. The length when contracted is only 0.18 inch, and is about 3½ times as long as wide. 2nd. The sutures are not brown-black when the body is contracted. 3rd. The sutures are never carinate. 4th. The lateral branchiæ are fully half as long as the body is wide, and the bipectinations are subobsolete: as in *Wilsoni*, those on the thoracic joints are proportionally shorter. 5th. The dorsal branchiæ, when contracted, are about 2½ times as long as wide and blunt at tip; but when extended are fully 4 times as long as wide, trumpet-shaped, almost acute at tip, and closely resembling the lateral branchiæ, towards the base they are slightly ciliate. As in *Wilsoni*, those on the thoracic joints are not so much developed, and those on the anal joint are about one-fourth longer. 6th. The two transverse rows of papillæ (pseudopods) on ventral joints 4—10 are each of them like the posterior row in *Wilsoni*. 7th. The anus is rather round than elongate.—Described from two specimens out of a lot from which, as hinted in the text, were bred Aug. 25th—Sept. 15th 7 ♂ 7 ♀ imagines 0.18—0.23 inch long, both sexes of a nearly uniform gray color except that the basal ⅜ or ⅝ of the abdomen both above and below is of an obscure clay-yellow in ♀, and in ♂ is of a much brighter yellow with a black dorsal line which is widely dilated before each suture. Such sexual distinctions seem to be not unusual in this group of flies; for Baron Osten Sacken informs us that "the sexes in *Anthomyia* generally differ very considerably in size and colorings.

HOMALOMYIA LEIDYI.—*Larva*—Judging from Dr. Leidy's brief description of a larva which, as will be subsequently stated in the text, was found on two occasions in the human bowels, and which—as he has given it no name—we have here for convenience sake designated as *Leidyi*, is intermediate in its characters between *Wilsoni* and *prunviora*. In length it is said to be from 0.25 to 0.29 inch. The dorsal branchiæ seem to agree generally with those of *prunivora*, We will now give such recorded cases as we have been able to glean, of the occurrence of the larvæ of Flat-flies or other Two-winged flies in the human bowels, whether in this country or in Europe. In Europe there are two species in particular, respecting which such facts have been recorded, namely, the Puppy Flat-fly (*Hom. canicularis*, Meig.) and the Ladder-fly (*Hom. scalaris*, Meig.) The larvæ of the former are well known to occur normally in rotten vegetables and decayed cheese, and the fly itself, from its being often noticed in houses, has been sometimes called "The Lesser House-fly," though from the true House-fly (*Musca domestica*) it differs by very conspicuous structural characters. The larvæ of the Ladder Flat-fly are met with in human excrements, and from their being often found in the putrid contents of privies, the fly itself has frequently been characterized as "the Privy-fly."

The Rev. L. Jenyns, of Cambridgeshire in England, published 30 or 40 years ago a very detailed account of the larvæ of the Puppy Flat-fly having been discharged from the intestines of a clergymen.* Fallen records a similar case, though he thought that the larvæ might possibly belong to an allied species.† On the other hand, Westwood tells us that in two different medical works, one in the German and the other in the English language, the larvæ of the Ladder Flat-fly are stated to have been found in the human body.‡ Several other European cases are on record, where the larvæ of Two-winged flies have either been evacuated from the anus or vomited from the mouth; but in most of them the genus to which they belonged cannot be accurately determined. In the United States, Dr. Leidy, as quoted by Dr. Packard,§ has recorded a case where numerous larvæ, supposed to be those of some Flower-fly (*Anthomyia*), were given to him for examination by a physician, who had obtained them from his own person. This physician, it is added, had been seized with all the symptoms of cholera morbus, and in his discharges he had detected numerous specimens of this, to him, unknown parasite. The above circumstances took place in the latter part of summer, and it was suspected that the larvæ had been swallowed along with some cold boiled vegetables. The very same kind of larva had been previously observed by Dr. Leidy in another such case, which was likewise accompanied by the ordinary phenomena of cholera morbus. On referring to the description of these larvæ published by Dr. Leidy, we find that they are represented as having very nearly the same kind of lateral gills as those which we have figured above; and they must consequently appertain to the Flat-flies and not to the Flower-flies (*Anthomyia*), as was erroneously supposed by the author of the description.

Of course, every one must perceive at once that a larva furnished with gills, and not liable to drown when immersed in fluid or semi-fluid matter, would stand a much better chance to live and flourish in the human stomach, than a larva that breathes the air much in the same manner as we ourselves do. But there is authentic evidence that larvæ which breathe through spiracles in the ordinary manner, and not through lateral gills, have been voided either upwards or downwards from the human body. For Dr. Leidy has further reported* a case where a number of specimens, which appeared to be larvæ of the Blue-bottle Fly, were given him by a physician as having been vomited from the stomach of a child; and Baron Osten Sacken has kindly informed us, that in the winter of 1868-9 some smooth Dipterous larvæ were handed over to him by a New York physician as having been voided in the excrement of a child; and that from one of them he reared what was apparently a specimen of the common House-fly (*Musca domestica*). So far as we are aware, this is the only case recorded by authors, where larvæ discharged from the human body have been actually bred to the perfect Fly state.

The question naturally recurs here—"How in all these numerous instances did so many larvæ find their way into the human body?" Two opinions, as the reader will have noticed, have been expressed above as to this knotty problem; one by Dr. Leidy's friend, that all the

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for they are described as being similar to the lateral branchiæ, whereas in *Wilsoni* they are mere tubercles. In one very remarkable respect, however, *Leidyi* differs both from *Wilsoni* and from *prunivora;* for instead of the dorsal branchiæ on the anal joint being still longer and slenderer than those on the preceding abdominal joints, they are stated to be mere "prominent tubercles," and are erroneously considered as spiracles. Again, in the arrangement of the ventral pseudopods, *Leidyi* seems to agree with *Wilsoni* rather than with *prunivora;* for according to the description, each ventral segment has the anterior row of papillæ cariniform, the carina apparently being considered as a "subdivision" of the segment. As Dr. Leidy's description is short, and inaccessible to many of our readers, we reproduce it here in full:—"Larva 3–3½ lines long, 1—1¼ lines broad; demi-elliptical, the articuli strongly marked, everywhere minutely shagreened; body anteriorly subacute, posteriorly obtuse. Head bipapillate, with a pair of hooks projecting from the mouth. Articuli furnished dorsally and laterally, each with six long posteriorly divergent flexible compound spines. Ventral segments transversely subdivided, the posterior subdivision furnished with a transverse row of papillæ. Caudal articulus dorsally sloping, furnished with a pair of prominent spiracular tubercles, and fringed with six spines. Anus ventral.—Described from 5 specimens." (From *Proc. Ac. Nat. Sc. Philad.* 1850, Biological department, page 8.)

* *Trans. London Entom. Soc*, Vol. 2nd.

† Quoted Westw. *Introd.* II. p. 570, note.

‡ *Ibid.* p. 571.

§ *Guide to the Study*, &c. 367.

* *Proc. Ac. Nat. Sc. Philad.*, 1859, Biological Department, page 8.

larvæ had been swallowed alive, along with such vegetable food as had been introduced in the ordinary course of nature into the stomach; the other by our friend Dr. Wilson, of Quincy, who expresses his belief that a few larvæ had been introduced through the mouth, and that then after getting into the alimentary canal had increased and multiplied there. We must crave leave to differ from both these gentlemen. In the first place, we can scarcely understand how larvæ of such considerable size and of so soft a consistence could escape being crushed more or less by the human teeth during the process of mastication; and in the second place, although in the whole Class of Insects there is a single most remarkable and exceptional genus (*Miastor*), belonging to the Gall-gnat (*Cecidomyia*) Family, which is known to propagate in the larva state, yet this is the exception and not the rule. For out of about a hundred thousand distinct genera of Insects which exist in the whole world, no other genus, so far as the records show, has the reproductive faculty developed until it reaches the mature or Perfect State. For these reasons, we incline to believe that larvæ discharged from the human body, in the manner recited above, must all of them have been originally introduced there in the egg state, and after reaching the stomach must have hatched out and fed upon the food taken from time to time into the stomach. No doubt, the great majority of eggs that are swallowed in this manner, even if they escape being crushed by the teeth, perish in the healthy human body, either before, or shortly after hatching out, owing to the unnatural conditions to which they are necessarily subjected there, both as regards temperature, and want of air, and the presence of that powerful chemical agent—the gastric juice. But in a diseased and abnormal body, it may, and doubtless does, occasionally happen, that the average temperature of the stomach is reduced much below the normal point, or that large quantities of gaseous matter containing oxygen are formed there, or that an insufficient supply of gastric juice is secreted there; and in such instances as these, the eggs may probably hatch out, and the young larvæ may, without any material injury to their health, grow and reach maturity.

It is not a very pleasant thing to have a stomach full of lively living maggots. Still, it should be borne in mind that, although such maggots may temporarily derange the health, there is no reason to suppose that they can ever cause death. Moreover, when more or less matured, such insects will always pass away, either dead or alive, by the ordinary modes in which such offensive matter is ejected from the human system; for it is utterly impossible that they can ever after developing into the perfect winged state, propagate their species among the semi-fluid contents of the alimentary canal. Consequently, unless a fresh supply of eggs is introduced into the stomach, the original generation of maggots will soon disappear; for with almost all the different larvæ of Two-winged Flies that subsist upon decaying matter, whether animal or vegetable, the larval period is comparatively quite short—say two or three weeks, or at most a month.

The nature of the substances upon which the larvæ usually discharged from the human body naturally feed—that is, decaying animal and especially decaying vegetable matter—indicates at once the manner in which the eggs that produce these larvæ gain admission into the stomach. We have already stated that we have bred great numbers of a small species of Flat-fly from rotten plums; and we may add here that the plums from which we bred the Fly were most of them only partially unsound when they were gathered and placed in the Breeding-vase, and that after they were placed there no living insect could possibly have gained access to them in order to lay its eggs upon them. Consequently, a good many of the eggs which afterwards produced the Winged Flat-flies must in all probability have been deposited in the open air upon plums that were only partially unsound—say with only a third or a fourth part of their flesh discolored and soft. Such fruit would be greedily devoured by many children, and by some grown persons who do not know any better. But we have ascertained by a somewhat extensive experience in breeding insects, that fruit which is either wholly or partially decayed almost invariably contains great numbers of the eggs of different Two-winged Flies, belonging to many different genera (*Sciara*, *Scatopse*, *Drosophila*, *Homalomyia*, and *Musca*), the larvæ of which naturally feed upon such substances. When, therefore, such decayed fruit is introduced into the human stomach, these eggs, being excessively minute, will doubtless many of them pass uninjured into the body; and if that body happens to be in a diseased and unhealthy state, they will probably hatch out and develop into a whole generation of larvæ.

In ninety-nine cases out of a hundred, perhaps, these intestinal larvæ will be voided without being noticed by any one; and the functional disturbance which they have caused will be attributed to cholera morbus, or summer complaint, or some other one of those numerous ailments which are especially prevalent in the summer season. And it will be only in the hundredth case, that attention will be called to their existence among the *fæces;* and even then probably not a hundredth part of such cases will be recorded in printed books, because most persons will be apt to confound together those larvæ which habitually live in decaying vegetable matter, and the ordinary Intestinal Worms (*Entozoa*), the native home of which is in the body of some animal or other. Taking everything into consideration, we doubt whether, out of ten thousand cases, where the larvæ of Two-winged Flies have existed in considerable numbers in the human intestines, more than one single case has been recorded in print for the edification of the world by competent entomological authority. And if this be a correct estimate, we may see at once how fearfully common such larvæ must be in the bowels of that most patient of all military heroes—General Public.

Moral.—Avoid eating decayed fruit, especially if you are in poor health, and from fruit which is only partially decayed pare away carefully the unsound parts before you introduce the sounder portions into your stomach. Every entomologist knows what a pleasing pursuit it is to breed insects through all their stages in appropriate vessels; but to breed them in one's own body is rather too much of a good thing.

PLANT-LICE AND THEIR ENEMIES.

Early in September I found my Chrysanthemums badly infested with black plant-lice—the species most often attacking the Composite family of plants—and a few moments' observation convinced me that this would be a grand opportunity to capture and study the various insects that visited them; and I concluded to sacrifice the plants, if need be, to this excellent opportunity of studying insects so close at the door. So, every pleasant day found me at my post, equipped with a low foot-stool for a seat, a good lens, and several glass tumblers in which to make my captures.

In a few days I had taken over thirty distinct species of *Ichneumons*, among which were rare ones that would delight the heart of an Entomologist to see. Some of these *Ichneumons* were attracted merely by the sweets given out by the plant-lice, which they eject through two honey-tubes near the extremity of the body. Sometimes there will be quite a little shower of this honey scattered upon the leaves below, as I have frequently felt it falling upon my hand. Various insects are attracted by this honey, which they lick off from the stems and leaves; while others, such as the Syrphus-flies, come for the purpose of depositing their eggs along the infested stems, which eggs are soon hatched into larvæ that feed upon the plant-lice; and still others come for the purpose of depositing their eggs in these Syrphus-fly larvæ.

There were several species of these gaily-dressed Syrphus-flies very busy about the plants; and I soon found that they were not attracted by the sweets like some of the other two-winged flies, neither were they preying upon their neighbors, like some other tribes that visited here, but they were depositing their eggs along the stems infested with the plant-lice. And I resolved to experiment with these different species. So, cutting several stems of Chrysanthemums, that were nearly covered with the black lice, I placed them in a small glass jar of water for keeping fresh, and covered the whole with a large oval glass. I then caught several of the flies and introduced them under the glass, where they blindly knocked their heads against the glass in the hopeless endeavor to escape. But finding all such attempts fruitless, they were at length resigned to their fate, and quietly settled down and began to examine the plants, and deposit their eggs among the plant-lice. The eggs hatched in a day or two into very minute whitish-looking, footless grubs; and here in the midst of their food, all the grubs had to do was to seize each a plant-louse, larger than itself, and, sucking out its juices, drop its lifeless body.

These Syrphus larvæ grew rapidly, and soon changed to a dark color, although I could not see that they changed their skins. Dark lines ran along the back, and the body was variously mottled with sober brown, very unlike their brilliantly attired parents.

When fully grown some of the larger species were an inch or more in length, and at this stage of their lives, very quickly would they clear a stem of plant-lice. Eating was the grand business of their lives; almost too lazy to move along after their food, they would stretch themselves to an incredible length in trying to reach a plant-louse, rather than take a step in advance. After one had seized its victim, it elevated its head perpendicularly, holding the plant-louse up in the air until its juices were extracted, and then with a sudden jerk throwing its lifeless body down.

When they were ready to assume the pupa form they ceased eating, and became quite uneasy, and I found they could crawl quite rapidly. Down the stems and jar they would come, and wander about over the paper on which the jar stood. I then consulted the books, and found that "the insect attaches itself by a glutinous secretion to the leaves and stems of plants; its body then contracts and hardens, and the insect assumes the pupa state within the larva skin." So I returned them to the plants; I wished them to be scientific larvæ, and did n't the books say they assumed the pupa state on the leaves and stems? But it was of no use, as fast as I returned them, down they would come. They were determined not to be scientific. So I gave them a little box of earth into which they immediately disappeared, where they assumed the pupa state; and in about a week thereafter, the perfect insects—the beautiful Syrphus-flies—made their appearance.*

In two or three instances the rightful tenant did not come forth from the Syrphus pupa; but an entirely different four-winged, sprightly busy-body had killed the owner and taken possession of its house. This was all plain to me, for I had caught the busy *Ichneumon* in the act of depositing her eggs in Syrphus larvæ while the latter were engaged in feeding upon the plant-lice.

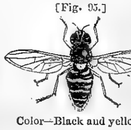
There is another enemy of the plant-lice, a minute *Ichneumon* [doubtless some species of *Aphidius*—Ed.] which causes greater consternation among them than all of their other foes. The Syrphus picked his victim off so quietly that it never seemed to dream that danger was near, until it was kicking on the end of his proboscis. But this very tiny *Ichneumon*, even smaller than its victim, would set a whole colony of plant-lice on a stem in commotion. Bringing my lens to bear upon such a stem, I invariably found the author of the mischief perched upon the back of an unlucky plant-louse, which was vainly endeavoring to dislodge her by *kicking* and throwing back its antennæ. But she was usually too firmly seated to be unhorsed, and patiently waited until quiet was restored, when she would introduce her ovipositor in the back of the plant-louse and leave an egg to hatch into a tiny larva which should finally eat into the vitals, causing a slow and lingering death. After the *Ichneumon* had deposited her egg, she quietly dismounted and proceeded to another plant-louse, which would in the same manner become restive, and again the alarm would be communicated to all on the stem. They would hold on to the stem by their beaks, and kick, and

[* The great bulk of the *Syrphus* larvæ with which we are acquainted fasten themselves to the leaves and stems of plants, before contracting to pupæ, but some have long been known to transform in the ground. According to Westwood, the pupa of *Cheilosia ruficornis* has been found at the root of a tree by Fallen, while the Root-louse Syrphus-fly (*Pipiza radicum* W. & R., see A. E. Vol. 1, p. 83) not only transforms under ground, but lives there in the larva state. In a recent letter, touching on this subject, Dr. Wm Le Baron, of Geneva, Ills., says: "The pupæ of *S. ribesii* have been found under stones, and Mr. Say discovered the pupæ of his *S. concava* attached by their ventral surface to rails From this it would seem that those larvæ which live upon leaves, desert these unreliable organs when about to pupate, and attach themselves to more permanent objects. Zetterstedt found the pupæ of *Aphritis*, Latr. (*Microdon*, Meig.) both under the bark of a tree and also attached to the stems of grass The larvæ of *Milesia*, *Criorhina* and *Xylota* are found in rotten wood, and probably they pupate in the same, or in the ground beneath. The same remark may be made of the genera *Syritta* and *Rhingia*, whose larvæ inhabit the dung of horses and cows. The larvæ of *Eristalis* and *Helophilus* are aquatic, and their larvæ are known to burrow in the ground, in order to undergo their transformations." At our request Mrs. Treat has sent us some of the bred flies which are mentioned in this article, and among them are three species of the genus *Syrphus* and one of *Helophilus*. The latter is the *H. latifrons* of Loew. (Fig. 94.) Of the three *Syrphus* flies two are undetermined in our cabinet and the other one we illustrate herewith (Fig. 95.) It is a quite common species, and we take it to be the Philadelphia Syrphus-fly (*Scæva* [*Syrphus*] *philadelphicus*, Macq.); but as there are at least three described N. A. species which bear a very close resemblance to each other, we forwarded a specimen to Dr. Le Baron for his opinion, and here subjoin his reply: "This is a common species, and seems to be the American representative of the equally common *Scæva ribesii* of Europe. The term *Scæva* is discarded by the German and French entomologists, being merged in the older genus *Syrphus*. The Swedish and English entomologists, however, retain it. The principal distinctions seem to be as follows: In *Syrphus* the abdomen is broader, being more oval than elliptical; the seta is sometimes plumose, but never so in *Scæva;* in *Syrphus* the epistoma descends more decidedly below the eyes; but the most conspicuous character is the painting of the abdomen, which in *Scæva* always consists of transverse yellowish bands, rarely interrupted in the middle, whilst in *Syrphus* it is either wholly wanting or reduced to a few triangular spots. If we consider the genera distinct, the present species will evidently come into the genus *Scæva*. This species comes very near *Philadelphicus*, but in those points in which Macquart distinguishes his *Philadelphicus* from the *ribesii* of Europe, it is curious that our species actually resembles the latter, viz., in the brown upper margin of the antennæ (which, in *Philadelphicus*, are wholly fulvous), and in the presence of a blackish spot just above the base of the antennæ. Our species also comes near the *S. concava* of Say, but the antennæ in that species are described as pale testaceous I should remark here that I have in my possession only Macquart's and Say's and Wiedemann's descriptions. Mr. Walker has described about twenty N. A. species, but the works which contain them, I believe, are not very easily accessible."

[Fig. 94]

Color—Black and yellow

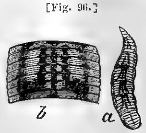
[Fig. 95.]



Color—Black and yellow.

In July, 1867, we bred this fly from larvæ which were feeding on a large red plant-louse (*Aphis rudbeckiæ*, Fitch) which congregates in immense numbers, head downwards, on the stalks of the Goldenrod. When full grown this *Syrphus* larva measures 0.30 inch; the general color is pale-yellow, inclining to sulphur-yellow, and it is variegated on the back with black, brown, and brick-red, as in Figure 96, *b*. These larvæ contracted to pupæ upon the stems of the plant, and upon the sides of the vessel in which they were confined. We also know that the closely allied *Syrphus ribesii* pupates sometimes upon stems, and Curtis (Farm Insects, p. 80) figures the pupa of *S. pyrastri*, Linn., likewise upon a stem. Thus it results (since this same species was also bred by Mrs. Treat from pupæ that form under ground) that the same species sometimes pupates above, and at other times below ground. May it not be, that those larvæ hatched during the summer months and which are destined to produce flies soon after they become full grown, invariably transform on the plants where they reside; while those which are hatched later in the season, and which may have to pass the winter in the pupa state, prefer to enter the ground to transform?—Ed.]

[Fig. 96.]



Colors—(*a* and *b*) Sulphur-yellow, black, and brick-red.

strike out in all directions; and this would set the ants—their attendants and protectors—hunting around, to find the cause of the alarm, but they never seemed to recognize the true author of the mischief. Two ants meeting upon such an occasion would put their heads together and seem to consult for a moment, and then proceed to drive off all the harmless flies and wasps that were attracted by the sweets alone.

Terrible was the fate of an unlucky Syrphus larva that happened in the way of an ant at such a time; the ant would take it in its mouth, and shake it as a dog will shake a wood-chuck. Several times I have attempted to rescue such a larva, but found it had always received its death wound and died shortly after.

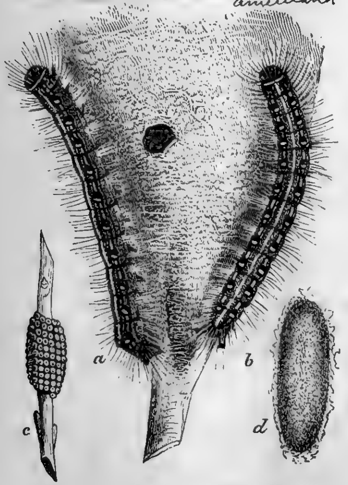
VINELAND, N. J. MRS. MARY TREAT.

[We gladly publish the above from Mrs. Treat, and hope her good example will be followed by other of our lady readers. It is really a wonder to us why the ladies do not more generally interest themselves in the pleasant and fascinating study of Entomology! There should be more Madame Merians. Original observations are always valuable, especially if accompanied by specimens of the insects spoken of.—ED.]

THE APPLE-TREE TENT-CATERPILLAR.

BY WM. LE BARON, M.D., OF GENEVA, ILLS.

[Fig. 97.] Clisiocampa americana



Colors—(a & b) black, white, blue and rufous; (c) yellowish-gray; (d) yellow.

More than two dozen different species of insects are now known to infest and damage the Apple tree. Some subsist upon the root; some burrow into the trunk; some infest the bark; some select the opening buds; some devour the expanded foliage, and others, finally, revel upon the fruit. Thus beset by enemies on every side, it would seem that that most valuable of fruit trees, the good old Apple tree, must ere long succumb, and cease to occupy its place in the family of plants. And this it would undoubtedly do if all these enemies were permitted to go on unchecked in their operations. But owing to the incessant antagonism of parasitic foes, and insectivorous birds, and human ingenuity, the ravages of these insects are kept within bounds, and the apple tree still lives. Of these numerous enemies of the Apple tree, five hold a bad pre-eminence, namely, the Round-headed Borer (*Saperda bivittata*), the Oyster-shell Bark-louse (*Aspidiotus conchiformis*), the Canker-worm (*Anisopteryx vernata*), the Tent Caterpillar (*Clisiocampa Americana*), and the Apple-worm (*Carpocapsa pomonella*). Of these the most conspicuous, and, in some seasons and localities, the most destructive, is the insect generally known as the Tent Caterpillar (Fig. 97, *a* and *b*), being the larva of a brick-colored moth (Fig. 98), known popularly as the American Lackey moth. This insect is a native of the more northern Atlantic States, and has been introduced into the West in the egg state, attached to the twigs of young trees. Though the crab-apple tree, upon which this insect readily feeds, grows wild at the West, yet the caterpillar is not found upon it except in the neighborhood of cultivated trees.

The eggs from which these caterpillars proceed (Fig. 97, *c*) are deposited by the parent insect in the latter part of June or the beginning of July, upon the smaller twigs, in oblong rings, each of which contains about two hundred and fifty eggs. These eggs are little thimble-shaped bodies, about one-twentieth of an inch in length. The young caterpillar, whilst in the egg, is bent double, the fold of the body being at the smaller end. The same degree of warmth which expands the buds of the apple tree, also hatches the eggs, so that the young caterpillars are born in the midst of abundance. It sometimes happens, however, especially in the cold and wet springs of New England, that the growth of the leaves is arrested by an unfavorable change in the weather, after the young caterpillars are hatched. To meet this emergency, these little insects are endowed with the power of sustaining hunger for a considerable time. When wholly deprived of food they will live from ten to twelve days. This species belongs to the tribe of Tent-making Caterpillars, and during the first two or three days of their existence they commence constructing a shelter for themselves by extending sheets of web across the nearest fork in the twig upon which they were hatched. As they increase in size they construct additional layers over those previously made, attaching them to the neighboring twigs, and leaving space enough between them for the caterpillars to pass. The shape of the tent is necessarily very irregular, depending upon the situation of the branches upon which it is constructed. The holes through which the caterpillars enter are situated near the extremities or angles of the nest. This nest when completed is about eight or ten inches in diameter. The caterpillars retreat into it at night and in stormy weather, and at other times when they are not feeding. The silken threads of which the web is composed are drawn from the body of the insect through a minute aperture situated behind the mouth, which is the outlet of two convoluted tubes, into which the ductile matter is secreted from which the silk is made. When going out to feed, the caterpillars always travel upon the upper side of the branches, and each one leaves a thread of silk behind it, which probably serves as a clue to direct it back to the nest. The silken trails thus formed are at first scarcely noticeable, but become very obvious after a branch has been traveled upon for a considerable time. Thus the caterpillar not only lives in a silken house, but covers its roads with a silken carpet. Like other larvæ, they shed their skins four times before arriving at maturity. When fully grown they are about one inch and three-quarters in length; but as they are widely known and easily recognized, I shall not here occupy space by describing them.

The eyes of this caterpiller have the appearance of very minute black points, being ten in number, five on each side of the head. Their position is best seen by holding the cast-off skin of a caterpillar towards the light, and examining it through a magnifying glass. Without claiming mathematical exactness, it may be stated that four of them are situated in a curved line, forming half a circle, of which circle the fifth occupies the centre. Owing to the extreme minuteness of the eyes of caterpillars in general, they were formerly overlooked, and these insects were supposed to be blind. That they possess the sense of seeing, however, and that, too, at a considerable distance, seems to be proved by the following experiments. If a nest of these caterpillars be taken from a tree and placed upon the ground several feet from it, they will return to it in a direct line. In another experiment a handful of caterpillars was placed in some tall grass between two trees, but nearer to one than the other. They first crept up the stems of the grass, as if for the purpose of taking an observation, and then took up their march for the nearest tree.

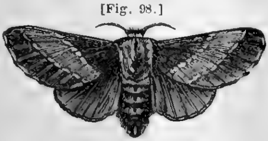
The leaves of the Apple tree constitute the food of by far the greater number of this kind of caterpillar. Nests are, however, occasionally seen on the other common fruit trees, the Peach, Pear, Plum, and Cherry, particularly the Wild Cherry. When deprived of other food they will also eat the leaves of the Rose bush.

The active period of this caterpillar, that is, the time from their hatching to their changing into chysalids, is from five to six weeks, and when we consider their voracious appetites and that there are about two hundred and fifty individuals in each nest, we can easily form an idea of the extent of their ravages. Where there happen to be several nests on one tree, or where the tree itself is small, they often strip it of every vestige of foliage; and in neglected localities, whole orchards are sometimes seen as bare of foliage on the first of June as in mid-winter. It is at about this date that the caterpillars cease their ravages, and the trees subsequently make an effort to recover, and do actually throw out a new set of leaves, but their fruitfulness for the season is destroyed, and the tree itself must have received a severe shock to its constitution.

After five or six weeks of voracious feeding, the caterpillars arrive at maturity, and then leave the trees, and are to be seen crawling in all directions upon the neighboring fences or other objects, in search of some suitable place in which to undergo their transformation into pupæ. They usually select some crevice or angle where they can get an attachment for their cocoons in two directions. Their favorite place is in the angle formed by the projection of the cap-board of fences or posts. In these positions they sometimes congregate so as to lie one upon another. When about to construct its cocoon, the insect attaches itself by its hindermost feet, so as to leave the anterior part of its body free for motion; then extending its body, it draws some disconnected lines across from one side of the angle to the other, to serve as outlines or stays. Then, working down nearer home, it draws its lines more densely so that near its body they constitute a pretty close texture, like a piece of loosely woven cloth, through which, however, the insect can be seen.

When the web is finished, the insect emits a yellow fluid with which it besmears the inside of the cocoon, and thus effectually conceals itself from view. (See Fig. 97, *d*). This species remains in the chrysalis state about twenty days. Some kinds of moths pass all the fall, winter and spring months, that is, three-quarters of the year, in this state. Some of these are enclosed in cocoons of such dense texture that the inner surface resembles glazed parchment, and would seem to be almost impervious to the atmosphere. This has given rise to the question whether insects in the pupa state cannot live without air, as well as without food. Some experiments performed with the chrysalids of the Tent Caterpillar go to disprove this notion. A number of cocoons were moistened with oil so as to exclude the air; in every instance the enclosed pupa perished without completing its transformation. The nicety and compactness with which the parts of an insect are folded up in its pupal envelope is, indeed, wonderful. No effort of human ingenuity could replace it there, after it has once emerged. Goldsmith, in his entertaining but fanciful work upon Animated Nature, asserts that insects of this kind, when they have emerged from the pupal covering, expand their wings so rapidly that the eye can scarcely attend their unfolding. This is very improbable, in any case, and in the species now before us, as I have often witnessed, the expansion of the wings is very slow and gradual, and yet steadily progressive, so that the time occupied in the operation does not usually exceed fifteen minutes.

[Fig. 98.]



Color—Pale brick-red.

The American Lackey moth, when fully developed, measures about one inch and a half from tip to tip of the expanded wings. It is usually of a pale brick color, but individuals are occasionally seen much darker, or of an ashy-brown color. Across the fore wings are two straight, oblique whitish lines. The antennæ are moderately pectinate, or feather-like, in the male, and very slightly so in the female. The hollow tongue, or sucker, through which insects of this order imbibe their nutriment, is wholly wanting in this species, as, indeed, it is generally in the particular group to which it belongs. Of course they take no food, and live but a short time. A number of these moths which were put into a box immediately after they had come from their cocoons, were alive on the third day, but were all dead on the fourth. Their short lives have but one object—the pairing of the sexes and the deposition of the eggs by the female, for a future generation. The following experiment illustrates some of their habits: Three female moths were enclosed in a glass vessel. They were quiet during the day, but became very restless as night approached, showing that like the moths in general, they are nocturnal in their habits. On the third day a twig of apple tree was introduced into the vessel. The moths immediately ran up upon it, and put themselves in position for laying their eggs. This was accomplished in the following manner. Placing herself transversely upon the side of the twig, she curved her abdomen under the twig and extended it up the opposite side as far as she could reach, and commenced depositing her eggs, one after another, gradually withdrawing the abdomen till she had laid a row of eggs across the underside of the twig. She then, in the same manner, deposited another row, parallel to and in contact with the first. Owing to their unnatural situation, or the absence of the opposite sex, or to some unknown cause, these moths in confinement succeeded in laying but two or three rows of eggs, whilst in a state of nature they lay from fifteen to twenty rows, containing in all an average of about two hundred and fifty eggs. They subsequently cover the eggs with a coating of brown varnish which effectually protects them from the vicissitudes of the weather. In no case, however warm or protracted the autumn may be, do these eggs ever hatch till the following spring. So that the Tent Caterpillar, unlike many of our noxious insects, never has but one brood in the season. How is it that these little germs of being remain insensible to the heats of July, August and September, and yet burst into vitality at almost the first touch of spring? We know that if the young caterpillars came out in the fall, they would perish from inability to eat the tough autumnal foliage. But what natural law can we conceive of, that exercises such a discretionary power?

Again, by what subtle and inscrutable instinct does the parent insect select those trees which are suitable for the deposition of her eggs, whatever may be their size, shape, or situation? How does this poor insect, of three days' duration, know that her future progeny can thrive upon the foliage of the Apple and the Cherry, whilst it would perish upon that of the Oak or the Ash? The actions of the higher animals seem to be governed by a motive power very similar to reason, and differing from it perhaps only in degree, whilst the instinct of insects often lies wholly beyond its domain; and, therefore, its nature will probably forever elude the grasp of the human understanding.

Insects, with respect to their social habits, are divisible into two classes: the gregarious, which live together in communities, and the solitary, which seek their subsistence independently, each one for itself. This distinction is of vast importance in its relation to the destructibility of the noxious species. This practical point may be illustrated by the habits of the present species at different periods of the day. At one time a brood of well grown caterpillars will be seen scattered over every part of a tree, and the attempt to capture and destroy them would be a hopeless task. But wait an hour or two, and all these insects will return and congregate in a tent eight or ten inches in diameter, when they can be removed by a single grasp of the hand. The solitary or separate feeding insects are generally beyond our control, but there is no excuse for permitting our trees to be damaged by the gregarious species, of which the Tent Caterpillar is an example. A few of these insects may be found and destroyed in the moth and chrysalis state. A much larger number can be detected and destroyed in the egg state, especially on small or nursery trees; but they for the most part escape our sight on large trees, owing to their smallness and to the fact that the varnish which covers them is almost precisely the color of the bark of the tree. But the tents of the caterpillars, when a week or more old, are very conspicuous objects, and are easily discovered and destroyed, either by crushing them under the foot or throwing them into the fire. When too high on the tree to be reached by hand, they can be captured by thrusting a stick into their nests, and turning it round and round, so as to entangle the web and the caterpillars together.

This caterpillar, like others, is subject to the depredations of parasitic insects, but their number and names have not yet been determined. The insectivorous birds generally reject the hairy caterpillars, and therefore we get but little help from them in the extermination of the present species. The Baltimore Oriole, or Golden Robin, is sometimes seen pecking at their nests, but they do not make of them a common article of diet. The only birds that I know which devour them greedily are the American Cuckoos (*Coccyzus Americanus* and *erythrophthalmus*). Mr. Nutall, the ornithologist, speaking of the former species, says he has known them to make their chief diet, both for themselves and their young, of the Tent Caterpillar. But these birds are not numerous enough to effect much in checking the spread of this prevalent insect. Fortunately, however, owing to the gregarious habits of these caterpillars, we have it in our power to protect ourselves from their ravages, by the payment of a small installment of that eternal vigilance which is the price of the husbandman's success.

APPLE TREE BORERS.

BY JOHN F. WIELANDY, JEFFERSON CITY, MO.

In Central Missouri the Flat-headed Apple-tree Borer, (*Chrysobothris femorata*, Fabr.) seems in many localities to be more common, and consequently more destructive, than its congener, the Round-headed Borer, and in most of the orchards I have had occasion to examine, scarcely ten trees out of every hundred can be said to have escaped its ravages altogether. I have, last summer, devoted a considerable share of my leisure time to an investigation of the habits of these mischievous insects, and my researches have resulted in satisfying me that a little care and attention are all that is necessary to guard trees effectually from the ravages of these borers.

In my own orchard, containing several hundred remarkably thrifty young three and four-year-old trees, at least one-half were attacked last summer—not less than twenty eggs, perhaps, being deposited on one tree, in some instances—but, by a liberal use of soap, aided by an occasional application of the knife, used before the larvæ were old enough to commit any material damage, I have succeeded in eradicating them so completely that not one single *Chrysobothris* is left in my orchard to tell

"the tale of the doom and destruction of his race,"

while the rows of smooth and vigorous young trees scarcely show the trace of a scar or an abrasion.

The first young larvæ, last year, made their appearance sometime during the month of June, being noticed, as usual, on the south and southwest sides of the trunks, ranging all the way from the foot to the crotch of the trees, with here and there one on the larger limbs. I am inclined to think that the eggs hatch very soon after they are deposited upon the surface of the bark by the female insect, as, notwithstanding my almost daily examinations, I have seldom succeeded in finding anything but their empty shells.

As soon as hatched the little borers bury immediately into the bark, and for some time lie concealed under a follicle of thin epidermis immediately beneath the surface. At that period of their existence they are exceedingly minute—mere threads, with one end apparently somewhat enlarged—and can be destroyed with a slight scratch of the knife, or even the finger nail, without the least injury to the liber or inner bark of the tree; and after the course of a few weeks, the spot where a young borer has been found and killed in this manner will be no longer noticeable to the eye. *This is the period during which I always aim to destroy the borers on my trees,* and it is but seldom, and by mere accident, that a few escape to grow to a larger size.

The intelligent observer may, by dint of practice and close attention, soon learn, as I have done, how to discover almost at first glance the place where a newly hatched borer lies concealed. A small drop of brown fluid, resembling tobacco-juice in color, usually reveals its presence, for at that early stage of its development the well-known sawdust-like excretions characteristic of the full grown larvæ must not be looked for.

The easiest and surest way to destroy these borers is by washing the stem of the tree, from the base to the crotch, with some alkaline solution; but in order to prove efficient, this must be done before they are large enough to have eaten their way very deeply into the bark. I have therefore found soap-suds a very valuable auxiliary in the persistent warfare I have waged against the borers. After trying various compounds, I now prefer to use a simple solution made from hard or soft soap, thinned out to a proper consistency by the addition of a strong brine of salt and tobacco stems. I do not advertise this remedy as a preventive, because my experiments with several nauseous drugs, including aloes, sulphur, assafœtida and lime, have led me to the conclusion that the olfactory nerves of the female *Chrysobothris* (that is, supposing that these insects are endowed with the sense of smell, a fact which entomologists have failed to make apparent) are proof against all nauseous odors. I have repeatedly found freshly laid eggs, and even young live borers just hatched, on trees that had been washed but a few days before with a solution of assafœtida and aloes; and besides, a few heavy dews, or a rain shower, will not fail to remove all traces of the strongest alkaline wash.

But although probably not a preventive, the solution I have indicated is a cure; for it will instantly and infallibly kill every borer that has not penetrated so deep under the bark, or into the wood, as to be beyond its reach. By performing the operation three or four times on all the trees in the orchard, the first time during the month of June, and the last from the middle to the end of August, and extracting with the knife a few borers that may chance to escape the penetrating effects of this wash, I know, from a satisfactory and most conclusive personal experience, that an orchard can be kept entirely free from these insects.

As I have stated before, the Flat-headed Apple-tree Borer invariably attacks the south and southwest sides of the trees, and is only found on the eastern or northern sides in exceptional cases. While I admit that the insect appears inclined to prey upon feeble and diseased trees that suffer from the effects of old wounds, sun-scald or neglect, I must at the same time remark, that it is an error to suppose that it will spare healthy, smooth trees. All the trees in my own orchard are, without exception, thrifty and vigorous, entirely free from bruises or sun-scald, and as large of their age as any I ever saw; yet half of them, at least, were attacked by the borers last summer.

The usual course with a large proportion of apple trees planted of late years in Missouri is the following: Trees received sound and in good condition from the nursery are attacked the second or third year after being set out in the orchard rows. When small, they are not seldom girdled around their entire circumference by the borers, and die outright. Many of those which survive come out of the encounter wounded and sadly worsted, and lead a lingering existence for a few seasons. The sun scalds the raw, open sores on their south side, and the persistent attacks of the borers, added to neglect and want of cultivation, increase the evil from year to year, until the trunk becomes sun-scalded and seared from top to bottom, and the tree finally dies. This has proved to be the fate of by far the greater half of all the apple trees planted in many portions of Missouri during the past ten or fifteen years, and it could be obviated by a little intelligent labor and care.

Although the Flat-headed Borer evinces a manifest partiality for the various sub-varieties of the *Pyrus malus* and *Pyrus baccata*, as well as for our own indigenous crabs, it must not be imagined that it disdains other food. I have found these borers preying upon the Pear, though seldom; occasionally upon the Mazzard, and Morello Cherry, the Plum, very often on the Silver Maple, and last year I found them in unusual abundance on my Peach trees. I was, indeed, somewhat surprised to notice that they were far more numerous on Peach trees than even the true Peach-tree Borer (*Ægeria exitiosa*, Say), an insect which has become somewhat scarce in this section within the last few years. The Peach trees were attacked by them in the same manner as described with apple trees, viz: on the southwest side of the trunk; but the larvæ were neither as large nor as fat as some I have cut out of Apple trees. Whether or not they attain their full development, and undergo all the stages of their transformation, when feeding on the Peach, I am unable to say. I observed that, on the Peach trees, gum generally oozed from the wounds caused by these borers, while this was not the case with the Cherry trees.

The Round-headed Borer (*Saperda bivittata*, Say), is much less common with me, and has, fortunately, as yet not infested this locality to the same extent and in as great numbers as the former species. Sometimes both species dwell together in the same orchard and *on the same tree;* often, however, the Round-headed Borer will be found mainly to infest a certain orchard, while another orchard, not a quarter of a mile off, will be exclusively attacked by the Flat-headed Borer. This is due, possibly, to differences of soil and exposure.

The same means are used to combat both; although, of course, allowance must be made for the peculiarities in the habits and modes of life of each. While the flat-headed species invariably attacks the southwest side of the tree above ground, ranging along the whole length of the trunk, the round-headed species manifests no special partiality for a particular point of the compass, and affects the north quite as much as it does the south, ranging commonly two or three inches above and five or six inches below the surface of the soil, around the entire circumference of the tree. Cutting out the grubs, and washing the base of the tree with the mixture I have recommended, are useful remedies. The application of scalding hot water, and the use of a wire to search for borers that were left to burrow deep into the wood, are all useful in their way, but I have not found occasion to apply these remedies upon any of my trees, as my method is to destroy these pests before they have caused irreparable injury to the trees. Mounding the trees with earth, as now practiced by some of the best peach-culturists, will, I have no doubt, be also found a good preventive against the Round-headed Borer.

My father, J. E. Wielandy, Esq., of Highland, Ills., a well-informed amateur horticulturist and pomologist, and a close observer, states that mounding the trees with coal ashes has been found productive of good results. Most of the coal burned in the West is bituminous, and the ashes being probably strongly impregnated with sulphureted gases, must be distasteful to the borers not less than the perfect insects. As in many places coal ashes can be had for the mere cost of hauling, it seems to me that this suggestion is worthy of a trial. The ground should be first scraped off to a depth of five or six inches, the tree carefully searched for borers, and the cavity then filled with ashes, which should be mounded at least one foot above the surface level of the soil. The month of May is the most proper season to perform this operation.

I know of not a few localities in this State, where, owing to the ravages of the borers, people almost despair of raising apples. To all such the short, practical suggestions contained in this communication will, if followed intelligently, be the means of stocking their failing orchards with a new growth of young trees as healthy and thrifty as my own.

[For the sake of scientific accuracy we hope our correspondent will breed the perfect insect from those borers which he finds in the plum, cherry and peach trees, and will report the result through our columns; for another species (*Buprestis divaricata*, Say) has long been known to attack these trees, and its larva resembles so nearly that of *Chrysobothris femorata* that the two may very easily be confounded.—Ed.]

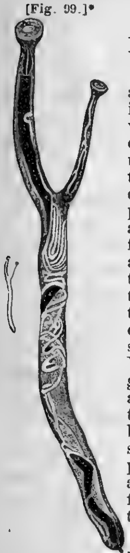
The "Peach Grub Man."—L. E. K., of St. Joseph, Michigan, says of the "Peach grub man:" "He has been around here selling a private plan for keeping grubs out of peach trees, which seems nothing more nor less than banking up the earth around the collar of the tree ten or twelve inches high in June and leaving it there until freezing weather in the fall. Yet simple as it may appear, it would seem by his subscription list that he has carried off a considerable amount of money from these parts. The dose was administered at various prices, varying from eight to twenty dollars, according to the number of trees owned by the victim. The same plan has long been in use, I believe, by some of our good cultivators. Now, it strikes me that it is bad enough to have our trees injured by the grubs themselves without having them attacked by a human vampire, who has filched the experience of others and then bartered it as his own for gold or greenbacks." L. E. K. evidently takes the papers, and is not to be caught!

GAPES IN FOWLS.

(*Sclerostoma* [*Strongylus*] *syngamus.*)

BY N. H. PAAREN, V. S.

[Fig. 99.]*



Color—Blood-red.

Dr. Wiesenthal, Professor of Anatomy at Baltimore, U. S., writing in 1797, says:

"There is a disease prevalent among the gallinaceous poultry in this country called the *Gapes*, which destroys eight-tenths of our fowls in many parts, and is most prevalent among young turkeys and chickens bred upon established farms. Chicks and poults, in a few days after they are hatched, are frequently found to open wide their mouths and gasp for breath, at the same time sneezing, and attempting to swallow. At first the affection is slight, but gradually becomes more and more oppressive, and ultimately destroys. Very few recover; they languish, grow dispirited, droop, and die. It is generally known these symptoms are occasioned by worms in the trachea. I have seen the whole windpipe completely filled with these worms, and have been astonished at the fowl's being capable of respiration under such circumstances."

What Dr. Wiesenthal wrote last century applies well to Gapes as prevailing in different parts of this country at the present time. Pheasants and partridges are also liable to the disease. Dr. Spencer Cobbold says:

"This parasite has been found and recorded as occurring in the trachea of the following birds, namely, the turkey, domestic cock, pheasant, partridge, common duck, lapwing, black stork, magpie, hooded crow, green woodpecker, starling, and swift. I do not doubt that this list might be very much extended if our British ornithologists would favor us with their experience in the matter. Hitherto I have been surprised to find how few of those to whom I have mentioned the subject appear to be acquainted either with the nature of the parasite, or with the various methods to be adopted in curing the disease to which its presence in the windpipe gives rise."

In the calf, the parasites are found in large numbers in the trachea, or partially developed in the substance of the lungs. It is the *Strongylus micrurus* which is found in the calf, and occasionally in the horse and ass. In lambs and kids, the parasite is termed *Strongylus filaria;* and in the pig, *Strongylus contortus.* In *Gapes*, the parasite is *Sclerostoma* (*Strongylus*) *syngamus* occupying the trachea and bronchial tubes of fowls.

We find, on examining the lungs of sheep at the slaughter-house, that almost all, in the first year of their lives, have indications of deposits in the lungs—at one time supposed to be tubercular, but which we now know is due to parasitic productions.

Strongyli are not easily killed. Ercolani has found them living thirty days after exposure to air. They were dried up, but being moistened with water, moved and gave other signs of life.

The freed eggs, at the time of their maturity, contain ciliated embryo capable of active progression. The prolonged action of moisture from without, aided by vigorous movements of the perfected embryo within, serves to loosen the end of the egg-shell, by the opening of which the animal is set free.

Dr. Spencer Cobbold has recommended the following course to be adopted in this disease of birds:

"First. When the worm has taken up its abode in the trachea of fowls and other domestic birds, the simplest plan consists, as Dr. Wiesenthal long ago pointed out, in stripping a feather from the tube to near the narrow end of the shaft, leaving only a few uninjured webs at the tip. The bird being secured, the web extremity of the feather is introduced into the windpipe. It is then twisted round a few times and withdrawn, when it will usually happen that several of the worms are found attached. In some instances this plan entirely succeeds. But it is not altogether satisfactory, as it occasionally fails to dislodge all the occupants.

"Secondly. The above method is rendered more effectual when the feather is previously steeped in some medicated solution which will destroy the worms. Mr. Bartlett, superintendent of the Zoological Society's Gardens, employs for this purpose salt, or a weak infusion of tobacco; and he informs us that the simple application of turpentine to the throat externally is sufficient to kill the worms. To this plan, however, there is the objection that, unless much care be taken, the bird itself may be injuriously affected by the drugs employed.

"Thirdly. The mode of treatment recommended by Mr. Montagu appears worthy of mention, as it proved successful in his hands, although the infested birds were old partridges. One of his birds had died from suffocation; but he tells us that 'change of food and change of place, together with the infusion of rue and garlic instead of plain water to drink, and chiefly hempseed, independently of green vegetables which the grass-plot of the managerie afforded, recovered the others in a very short time.'

"Fourthly. The plan I have here adopted, by way of experiment, of opening the trachea and removing the worms at once. This method is

* We are indebted, for this illustration, to Prof. Jos. Leidy, of Philadelphia, who has had the kindness to have it copied, after Siebold, from *Archiv. f. Naturgeschichte*, 1836, plate III, where it is called *Syngamus trachealis*. The figure is highly magnified, and the large portion represents the female, and the smaller arm the attached male.—ED.

evidently only necessary when the disease has advanced so far that immediate suffocation becomes inevitable; or it may be resorted to when other methods have failed. In the most far-gone cases, instant relief will follow this operation, since the trachea may with certainty be cleared of all obstructions.

"Lastly. The most essential thing to be observed, in view of putting a check upon the future prevalence of the disease, is *the total destruction of the parasites after their removal*—a precaution, however, which cannot be adopted, if Mr. Montagu's mode of treatment is followed. If the worm be merely killed and thrown away (say upon the ground), it is scarcely likely that the mature eggs will have sustained any injury. Decomposition having set in, the young embryos will sooner or later escape from their shells, migrate in the soil or elsewhere, and ultimately find their way into the air-passages of certain birds in the same manner as their parents did before them."

I will in a few words give the results of my own observations. I have had, at different times, the disease amongst my own hens. Doctoring them according to books has invariably failed with me. I concluded to experiment, even at the risk of a few, and succeeded with the last two I had suffering with the disease. One of these had the windpipe completely filled up, and was about suffocating.

The only remedy with which I have had success, is the carbolic acid, which I have found very serviceable, both as a preventive, and as a pretty sure remedy, even in far gone cases. The following is my mode of treatment:

Dissolve one grain of pure crystalline carbolic acid in ten drops of alcohol, and add half a drachm of vinegar. Strip a small quill feather till within half an inch of the narrow end of the shaft. Secure the feathered patient, moisten the feather in the solution, and introduce it into the windpipe, turning it round once or twice, and then remove it. It will dislodge the worms, and bring back many of them adhering with slime on to it. Great dexterity is required, and some little knowledge of the anatomy of the parts: a slow, unskillful operator may kill the already half-suffocated bird, instead of curing it. Next I put the bird in a coop, with some shavings dipped in a solution of the carbolic acid (half an ounce of the crystalline acid, well mixed with one quart of water). Food and water is given in small tin boxes placed convenient to the bird. Administer flour of sulphur, with a little ginger, in poultaceous food, composed of barley-meal and coarse corn-meal. In the drinking water placed before the bird, should be mixed a few drops of the last-mentioned solution. The mouth and beak should be washed morning and evening with some of the solution. The shavings should be removed mornings, or be sprinkled well with the solution morning and evening.

If at all curable, the bird will be free from the disease within three days. The bird should be kept in a dry, warm place, apart from the rest of the fowls.

As a PREVENTIVE I feed young chicks twice a week with wheat, steeped in a solution of carbolic acid (the solution to be in the proportion of one teaspoonful of my above-mentioned solution to one pint of water). All wood and coal ashes from the house, is thrown into the nest-house, and on the floor of the roosting-house—having both houses separate. The roosting house is thoroughly cleansed every Saturday, and some of the solution of carbolic acid sprinkled on the floor and roosts once every month. The disinfecting and deodorizing properties of the carbolic acid, render it alike valuable as a preventive of contagion, and as a destroyer of vermin.

P. S.—As the carbolic acid is sparingly soluble in water, the solution recommended should *always* be shaken before used.

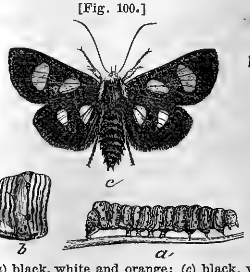
INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 6.

The Blue Caterpillars of the Vine.

Besides the large Sphinx caterpillars, described and figured in previous numbers, every grape-grower must have observed certain so-called "Blue Caterpillars," which, though far from being uncommon, are yet very rarely sufficiently numerous to cause alarm, though in some few cases they have been known to strip certain vines. There are three distinct species of these blue caterpillars, which bear a sufficiently close resemblance to one another, to cause them to be easily confounded. The first and by far the most common in the West, is the larva of

THE EIGHT-SPOTTED FORESTER—(*Alypia*

[Fig. 100.]



Colors—(*a*) black, white and orange; (*c*) black, white, orange and yellow.

octomaculata, Fabr.)—This larva (Fig. 100, *a*) may often be found in the latitude of St. Louis as early as the beginning of May, and more abundantly in June, while scattering individuals (probably of a second brood) are even met with, but half-grown, in the month of September. The young larvæ are whitish with brown transverse lines, the colors not contrasting so strongly as in the full-grown specimens, though the black spots are more conspicuous. They feed beneath the leaves and can let themselves down by a web. The full-grown larva often conceals itself within a folded leaf. It is of the form of our figure, and is marked transversely with white and black lines, each segment having about eight light and eight dark ones. The bluish appearance of this caterpillar is owing to an optical phenomenon from the contrast of these white and black stripes. The head and the shield on the first segment are of a shiny bright deep orange color, marked with black dots, and there is a prominent transverse orange-red band, faint on segments 2 and 3, conspicuous on 4 and 11, and uniform in the middle of each of the other segments. In the middle segments of the body each orange band contains eight black elevated spots, each spot giving rise to a white hair. These spots are arranged as in the enlarged section shown in the engraving (Fig. 100, *b*), namely, four on each side as follows: the upper one on the anterior border of the orange band, the second on its posterior border, the third just above spiracles on its anterior border—each of the three interrupting one of the transverse black lines—and the fourth, which is smaller, just behind the spiracles. The venter is black, slightly variegated with bluish-white, and with the orange band extending on the legless segments. The legs are black, and the false legs have two black spots on an orange ground, at their outer base; but the characteristic feature, which especially distinguishes it from the other two species, is a lateral white wavy band—obsolete on the thoracic segments, and most conspicuous on 10 and 11—running just below the spiracles, and interrupted by the transverse orange band.*

This larva transforms to chrysalis within a very slight cocoon formed without silk, upon, or just below, the surface of the earth, and issues soon after, as a very beautiful moth of a deep blue-black color, with orange shanks, yellow shoulder-pieces, each of the front wings with two large light yellow spots, and each of the hind wings with two white ones. Our illustration (Fig. 100, *c*) represents the female, and the male differs from her in having the wing spots larger, and in having a conspicuous white mark along the top of his narrower abdomen.

We have on one or two occasions known vines to be partly defoliated by this species, but never knew it to be quite so destructive as it is represented in the following communication from Mr. W. V. Andrews, of New York city, which we take from the February (1869) number of the *American Naturalist:*

"That a man should desire to raise his own Isabellas is laudable and praiseworthy; and I see no reason why such desire should exist exclusively in the breasts of our bucolic friends. The inhabitants of New York, as a general thing, clearly are of the same opinion, as is evidenced by the number of grape-vines ornamenting the doors and trellis-work of the houses of our citizens; not, of course, in the benighted regions of Wall street, but up-town; say from Sixteenth street, northward. A friend of mine residing on Thirty-fourth street, showed me, in March last, a very fine vine, which he calculated would produce him sundry pounds of very choice grapes, and in the pride of his heart he invited me to "call along" occasionally, and feast my eyes on the gradual development of the incipient bunches. Thinking that August would be a good month for my visit, I "called along," wondering in my mind whether my friend would, when the time of ripe grapes came, desire me to help myself out of his abundance; or whether he intended to surprise me with a little basket of nice bunches, garnished with crisp, green leaves. The first glance at the grape-vine banished all doubts on this point. There were an abundance of bunches on the vine, in a rather immature condition, of course, but of foliage there was not a trace. Of course I expressed my surprise, though, for certain

*We quote here Harris's full description of this larva (*Correspondence*, p. 286), as it agrees with ours, except in giving the number of transverse black lines as 6 on each segment, instead of 8, from the fact that he does not include the two which border the orange band, on account of their being interrupted. We have preferred to consider each segment of this worm as 8-banded, to distinguish it more readily from the other two species, which have respectively only six and four: "Length, when at rest, one inch and two-tenths, very pale blue, transversely banded with orange on the middle of each segment, the bands dotted with small black points, producing hairs, and surmounted by black lines, and between each of the bands six transverse black lines. A large, irregular, white spot on the side of the tenth and eleventh segments, and a series of smaller white spots on each of the other segments except the first three. Head orange dotted with black. Legs blackish externally. The full-grown have a decidedly bluish tinge, entirely owing, however, to an optical phenomenon from the contrast of the white with the transverse black lines. The head is of a pale dirty orange or rusty yellow, with about eight black dots on each side; a semicircular plate on the top of the first segment and the anal valves are pale orange dotted with black. There is a transverse series of black dots on the second and third segments, without an orange band. Each of the other segments is transversely banded with orange and dotted with black; the dots being in two alternate rows, and all of them emitting distinct, long, whitish hairs. Between each of the bands there are six slender, continuous, black transverse lines. The points are also connected by interrupted black lines. Legs at base orange, black externally and at tip, except the anal pair which are orange, dotted with black. The large white lateral spot is common to the side of the tenth and eleventh segments. The other lateral white spots are situated immediately behind the bands on the fourth, fifth, sixth, seventh, eighth and ninth segments, the anterior spots being largest; and thence they diminish to the ninth, while again the posterior spot is very large and very distinct The orange bands are interrupted on the top of the seventh, eighth and ninth segments."

reasons, I felt none; and asked my friend why he selected a species of vine for shelter, ornament, and use, which produced no foliage. He rebuked my ignorance pretty sharply, and told me that a few weeks before, the tree was covered with leaves; but, for some inexplicable reason, they had all disappeared—eaten, he guessed, by something. He guessed right. There were at least a hundred of the larvæ of *A. octomaculata*, the rear guard of a mighty host, wandering about the branches, apparently for the purpose of making sure that no little particle of a leaf was left undevoured. Pretty little things they were, with harmoniously blended colors of black, yellow and blue, but so terribly destructive! I had the curiosity to walk through all the streets to the east of Third avenue, as low as Twenty-third street, and every vine was in the same predicament. If grape leaves, instead of fig leaves, had been in request for making aprons, and one *Alypia* had been in existence at the time, I doubt if in the whole Garden of Eden enough material would have been found to make a garment of decent size. The destruction of the crop for 1868 was complete.

"This was bad. But it was not half so bad as the helpless ignorance which possessed nearly all of the unfortunate owners of vines. Scarcely one that I conversed with had the remotest idea of the cause of the disaster, and when I explained that it was the caterpillar of a beautiful little black moth, with eight whitish yellow spots on its wings, which had eaten up the foliage, my assertion was received with such a smile of incredulity, as convinced me that there is no use in trying to humbug such very sharp fellows as are the New York grape-growers.

"It is a little remarkable, however, that the destruction was confined to the eastern part of the city. I saw several luxuriant vines on the western side; and across the river at Hoboken, and at Hudson City, not a trace of *A. octomaculata* was discernible.

"The insect, then, is very local in its habits, and it is a day-flyer; and, from these facts, I infer that its ravages may be very materially checked. A little poisoned molasses, exposed in the neighborhood of the vine, would operate on the perfect insect; while a good syringing with *soft soap* and water, would bring down the caterpillars effectually."

THE BEAUTIFUL WOOD NYMPH—(*Eudryas grata*, Fabr.)—Here is another moth (Fig. 101),

[Fig. 101.]

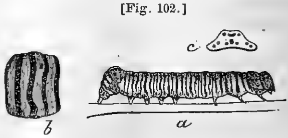
Colors—Cream, brown and olive-green.

surpassing in real beauty, though not in high contrast, the species just described. The front wings are milk-white, broadly bordered and marked, as in the figure, with rusty-brown, the band on the outer margin being shaded on the inner side with olive-green, and marked towards the edge with a slender wavy white line: under surface yellow, with two dusky spots near the middle. The hind wings are nankin-yellow, with a deep brown border, which does not extend to the outer angle, and which also contains a wavy white line: under surface yellow, with a single black spot.

Surely these two moths are as unlike in general appearance as two moths well can be; and yet their caterpillars bear such a close resemblance to each other, and both feed upon the Grape-vine. The larva of the Beautiful Wood Nymph is, in fact, so very similar to that of the Eight-spotted Forester, that it is entirely unnecessary to figure it. It differs more especially from that species by invariably lacking the white patches along the sides; the hairs arising from the black spots are less conspicuous, while the hump on the eleventh segment is somewhat more prominent. The light parts of the body have really a slight bluish tint, and in specimens which we have found, we have only noticed six transverse black stripes to each segment. This larva, when at rest, depresses the head and raises the third and fourth segments, Sphinx-fashion. It is found on the vines in this latitude as early as May and as late as September, and it devours all portions of the leaf, even to the midrid. It descends to the ground, and, without making any cocoon, transforms to a chrysalis, which is dark colored, rough, with the tip of the abdomen obtusely conical, ending in four tubercles, the pair above, long and truncate, those below broad and short (Packard). Some of them give out the moth the same summer, but most of them pass the winter and do not issue as moths till the following spring.

THE PEARL WOOD NYMPH—(*Eudryas unio*, Hübner).—This is another pretty little moth, so

[Fig. 102.]



Colors—(*a* and *b*) pale-blue, black and orange.

closely allied to, and so much resembling the preceding species, that it is not necessary to produce its picture. It is a smaller species, and differs from the Beautiful Wood Nymph in having the outer border of the front wings paler and of a tawny color, with the inner edge wavy instead of straight; and in that of the hind wings being less distinct, more double, and extending to the outer angle.

The larva is said by Dr. Fitch to so much resemble that of the preceding species that "we as yet know not whether there are any marks whereby they can be distinguished from each other." (Report 3, § 124). The moth is more common in the West than its larger ally, and though we have never bred it from the larva, yet we have often met with a worm (Fig. 102, *a*) which, for various reasons, we take to be this species. It never grows to be quite so large as the other, and may readily be distinguished by its more decided bluish cast; by having but four light and four dark stripes to each segment (Fig. 102, *b*); by having no orange band across the middle segments, and by the spots, with the exception of two on the back placed in the middle light band, being almost obsolete. The head, shield on the first segment, hump on the 11th, and a band on the 12th, are orange, spotted with black, the hump being marked as at Figure 102, *c*. Venter orange, becoming dusky towards head; feet and legs also orange, with blackish extremities, and with spots on their outside at base.

This worm works for the most part in the terminal buds of the vine, drawing the leaves together by a weak silken thread, and cankering them. It forms a simple earthen cocoon, or frequently bores into a piece of old wood, and changes to chrysalis, which averages but 0.36 inch in length: this chrysalis is reddish-brown, covered on the back with rows of very minute teeth, with the tip of the abdomen truncated, and terminating above in a thick blunt spine each side.

From the above accounts, we hope our readers will have no difficulty in distinguishing between these three blue caterpillars of the Grape-vine. But, says the practical grape-grower, "what does it concern me to know whether the little blue varmints that are defoliating my vines, belong to this species or to that? All I wish to know, is how to get rid of them, and as they are all three so nearly alike, the remedy applied to one must be equally effectual with the others." Gently, dear reader; it *may* prove of considerable importance that you know which particular species infests your vines! If you live in the West, and find the larva of the Beautiful Wood Nymph, then you need feel no alarm, while if you live in the East and find that of the Pearl Wood Nymph, you may in like manner put your hands in your pockets and go your way with an easy mind; for neither of these species are likely to become troublesome in those respective sections of the country, since heretofore they have always been quite rare in those parts. Again, the larvæ of the two Wood Nymphs have a fondness for boring into old pieces of wood, to transform to the chrysalis state, and Mr. T. B. Ashton, of White Creek, N. Y., found that they would even bore into corn cobs for this purpose in preference to entering the ground, wherever such cobs were accessible.* The Eight-spotted Forester, on the contrary, has no such habit, and while the only mode of combating it is to pick the larvæ off and burn them, the Wood Nymphs may be more easily subdued by scattering a few corn-cobs under the vines in the summer—to be raked up and burned in the winter.

SOUTHERN NOTES.

BY J. PARISH STELLE, OF TENNESSEE.

ENTOMOLOGY IN THE SOUTH.—A person who has never passed a season in the South, can form no correct idea of the vastly increased numbers of insects which we have down here, compared to the numbers existing in the North. I verily believe that after crossing the old "Mason and Dixon's line," each degree of distance southward doubles the number of every species, to say nothing of the hundreds of new species peculiar to a warm country, that are brought in by change of climate as one goes down.

Why the South has more insects than the North is a question easily answered. In the North the severity of the winter kills a large per cent. of them, and holds back those which it does not kill to a late start in the spring, while down here where there is, comparatively, no winter, almost every individual lives through, and is ready to propagate its species so soon as the proper season has rolled around. Even as far up as the southern portion of Tennessee, I could go out almost any day in mid-winter and make up quite a respectable cabinet of living insects. This morning (January 15), I took a stroll along the edge of one of our cypress swamps, and saw a goodly number of grasshoppers and other insects moving merrily about the land, while a passable turn-out of dragon-flies were briskly skimming here and there above the water.

Undoubtedly the heaviest clog to the wheels of culture in the South is noxious insects; yet, and I am sorry to say it, little or no steps are being taken with a view to making it otherwise. In some localities we occasionally suffer from drouth, and the people living there are now

* Fitch's Rep. 3, p. 82.

talking earnestly of irrigation; in others, our soil is thin, and there they are making arrangements to fertilize; but where is the locality that is taking any special stand towards encouraging a promulgation of entomological knowledge—the very thing, among all others, of which we are really in greatest need?

I can form no reasonable hypothesis by which to account for this, unless it be, that since our new life, as it were, began, we have been too closely engaged in meeting our immediate necessities to be able to give proper attention to even our greatest wants. In fact, we can plead nothing else; for the good results that are coming to light in those States encouraging entomological research, though less cursed with noxious insects than our own section, renders it impossible for us to reasonably feign an ignorance of the benefits to be derived.

It is, undoubtedly, a mere question of time with us, and I hope our culturists and others who wish to see our section great, and know the channel through which her greatness must come, will take early steps to make that time as short as possible. Let us have a State Entomologist in each Southern State, and thus save to our interests, at a cost too insignificant to merit a mention, millions of dollars every year. A little agitation rightly put in will bring the thing about at no distant day—all required is for the proper persons to take hold of it with a determination to succeed. And I would urge upon every Horticultural Society, and every other club or society of culturists in the whole South, to leave no steps untrodden, in the meantime, that could tend towards interesting the people in Entomology. Bring up the subject at your meetings—discuss it—read and post yourselves in the intervals of your comings-together, and, above all things, urge your people to benefit themselves by patronizing some publication devoted to the science. A good work towards checking the ravages of noxious insects may go on in this way before an Entomologist is officially in the field.

Look out for a Bad Bug.—The Harlequin Cabbage-bug (*Strachia histrionica*, Hahn), referred to on page 79, Vol. II of this magazine, is moving northward with such rapid strides as to make me think it highly probable that our friends above the Ohio will form its acquaintance in the course of the coming summer. In 1866 it appeared in Texas, and in 1867 we found it in the Carolinas near the coast, and in Georgia, Alabama and Mississippi, as far up as Macon, Tuscaloosa, and Columbus. In 1868 its fall brood (it hatches two broods each season) appeared along the northern lines of Mississippi and Alabama. In 1869 both broods hatched along these lines, working wholesale destruction, while its fall brood was noticed in Tennessee, above Humboldt, and almost as high as Nashville.

So far, the change of climate does not seem to have affected this insect in the least—it was as numerous and as destructive along the southern line of Tennessee last summer as it had previously been at any point further south. A careful study of its character has warranted me in predicting that it will scarcely stop short of the great lakes.

A Cheap Mosquito Bar.—There is a paragraph now going the rounds of the Southern papers to the effect that oil of pennyroyal scattered about a room in small quantities will keep mosquitos out. I know that pennyroyal is offensive to some insects, and never having tried it on the mosquito, I might feel inclined to think that some other person had, did the paragraph not go on further to state that "a handful of cucumber parings scattered about the house" would exterminate roaches, and that no fly would light on a window previously "washed with water in which a little garlic had been boiled." It would be hard for one to put much faith in such a "roach exterminator;" nor could he readily believe garlic so very disagreeable to flies, since personal observation has so often told him that in the cities the best begarlic'd regions are the regions in which they do most delight to congregate. An association of all these things point to the conviction that the writer was no better informed on one branch of his subject than on the others, and that, consequently, pennyroyal would stand a fair chance, at least, of being a very unsafe thing to rely on as a mosquito bar.

But there is a cheap *mosquito bar* in vogue among the plantation-hands and boatmen in some parts of the South, which answers every purpose to the letter: it is common coal oil. A small quantity of oil is dropped on a piece of cotton and then squeezed out as dry as possible; after which the cotton is rubbed over the face and hands. No mosquito will alight where the scent has been left. I have tried it and then exposed myself to clouds of them on various occasions without experiencing the slightest annoyance. Thousands of them would hover within an inch of my face, and sing by the hour, but none would dare touch.

Without having tried it, one would naturally suppose that the smell of the coal oil would be very disagreeable: not so; one never smells it at all in five minutes after it has been applied.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund, and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

COW-KILLER—*Clarksville, Texas, Dec. 25th, 1869.*—I never heard any reason given for applying the term Cow-killer to *Mutilla coccinea*. It is very generally known by that name here, and I am under the impression that the male stings as well as the female. I have always been very careful in capturing them. A. H. R. B.

[We assure our correspondent that he need take no precaution in capturing the winged or male *Mutilla*. The sting is a modified ovipositor, and is not possessed by any male bees or wasps. If you ever get stung by following our advice, we will come down to Texas, and in the interest of science, allow ourselves to be "blown" by the "Screw-worm," and tortured to death by the "Buffalo gnat," so as to ascertain what these two insects really are, of which we have heard so much and seen so little. Will not some of our Texan correspondents enlighten the entomological world by giving us a full account of these two insects? We should also like to receive active, living specimens of the Osage-orange worm mentioned on page 186 of our first volume.—ED.]

THE RAPE BUTTERFLY—*New York, Jan. 24, '70.*—In an article written by Chas. S. Minot in the last number of the ENTOMOLOGIST, it is stated that a few specimens of the Rape Butterly (*P. rapæ*) have been found in New Jersey. In and around Hudson City and West Hoboken they were very abundant last summer, and I venture to predict that next summer will see them more abundant still, and their sphere of action among the cabbages consequently enlarged. In the early part of the season, wishing to obtain a few larvæ, I asked a German gardener permission to "interview" his cabbages. He flatly refused on the ground that I should damage them. In two months after that, he had not a cabbage worth—well, say a "cent." But there were lots of *P. rapæ* flying about, giving his cabbage-garden an appearance similar to that it would have in a small snow storm. W. V. A.

BLISTER BEETLES ON COMPOSITE FLOWERS—*Vineland, N. J.*—The enclosed two species of Blister-beetles, did much damage to our Composite plants last summer, particularly to the dahlias and asters. The asters in this neighborhood were almost completely ruined by them. They would congregate on the flowers in the same way as the Rose-bug does on a rose, and it was only by eternal vigilance that I succeeded in saving any seed from some very fine dwarf asters from Vick's.

[The two species enclosed were the Margined Blister-beetle (*Lytta marginata*, Fabr.), and the Black Blister-beetle (*Lytta atrata*, Fabr.—ED.]

THE HARLEQUIN CABBAGE BUG IN TENNESSEE—*Savannah, Nov. 23d, 1869.*—I send you one of our new Cabbage Bugs (*Strachia histrionica*, Hahn, Fig. 56). It made its first appearance in this region late in the summer, and completely swept out all our cabbage. It seems to be working north, as it was at Florence, Ala., fifty miles south of us, last year. J. P. S.

THE PEA-WEEVIL—*New Harmony, Indiana, Feb. 1, '70.*—The Pea-weevil (*Bruchus pisi*) might easily be kept down to a moderate number if pea-growers could be moved to adopt a right method. I never plant a pea with a live weevil in it. I keep the peas two years, then, of course, the weevil is dead; and I take care that they do not escape before they die; consequently, instead of having a bug in every pea, and eating as many bugs as peas, a large number of the peas are free from them, and are, therefore, pleasanter in idea, if not in taste; and we have some finer seed than we should have if we planted bugs as well as seed. As our neighbors cannot endure to provide seed two years in advance, they all plant bugs, or let their bugs escape; and, consequently, we are supplied with bugs from their gardens; but we do not have them so soon, nor in such numbers, as we should have by the usual plan. I dry the seed-peas until I think they will not mould, and then I put them in bags and hang them up in an airy place, taking care to tie the mouth of the bags close. Then, that they may not become too dry, about Christmas, I put the peas into bottles and cork them, and let them remain until the second spring afterwards. The peas are not in any way injured by being two years old. I have had three-year old peas grow very finely.

MARGARET CHAPPELLSMITH.

HORIZONTAL VS. VERTICAL COMBS—*Waterbury, Conn., Feb. 15, '70.*—In the March, 1869, number of the ENTOMOLOGIST, page 141, you say the nests of our social wasps are never built with the cell horizontal like the European species. August last I found a nest on a small bush built with the cells like you figure. I captured the wasp on the nest, which I send for identification. The wasps were quite plenty on blackberries. I never before saw a wasp nest on a bush, but have seen many on fences and under eaves, which were all built with the mouth of the cell down, and, I *think*, the wasps were larger and different.

I have found *Eumolphus auratus* as abundant on *Apocynum cannabium*, var. *glaberrinum*, as it is on *A. androsæmifolium*.

The *Dryocampa imperialis* moves its scales in a small place on the back of the thorax, as if they were driven out and in by air from underneath. W. H. PATTON.

[Since the article on wasps, referred to by our correspondent, was published, we have met with a small nest of *Polistes metricus*, Say, which was built in a vertical position, with horizontal cells, the nest being attached laterally by a central pedicel or point. The species sent by our correspondent is the *P. fuscatus*, Fabr., and we thus have two exceptions to the rule laid down in that article, that the American species of this genus build horizontal nests with vertical cells, while the European species build vertical nests with horizontal cells. We have never noticed the peculiar motion of the scales on the thorax of *Dryocampa imperialis*.—ED.]

SQUASH BUG AND WHITE BUSH SCOLLOP—*Jefferson City, Mo., Feb.* 6, '70.—I think you make a mistake in stating that the Squash Bug does not touch the White Bush Scollop Squash (November No., p. 55). I have raised nearly all the varieties of squash for several years, and am *sure* that both the Squash Bug (*Coreus tristis*) and the Striped Cucumber Beetle (*Diabrotica vittata*) attack all *more or less*. But here is the difference: Some of the varieties have large, tender, succulent leaves and stems, like the Hubbard, for instance; and if they are planted in near proximity to the harder, tougher varieties, the bugs and beetles will attack the first in preference. That is all. I have never succeeded in raising the Hubbard, Boston Marrow, Mammoth, or Turban; these the bugs will always take. The following varieties are likely to be slighted and passed by whenever the bugs can get at the former: Early Yellow Bush Scolloped, Early White Scolloped, Early Bush Summer Crook-neck, Fall or Winter Crook-neck, and Yokohama. This latter excellent winter variety, from Japan, has very hard, tough stems and leaves, and usually escapes unscathed. By planting the tender varieties here and there among the others, the bugs will congregate upon them, and can be destroyed more easily, and thus a crop can be secured, as the balance will escape. This is on the same principle of planting nectarines among peach trees to attract the Curculio. J. F. WIELANDY.

THE MANGOLD-WURZEL FLY—*New York, Feb.* 4, '70.—The Rev. Mr. Haughton describes, in the "Quarterly Journal of Microscopic Science," the fly whose larva has recently proved destructive to Mangold-wurzel. Until last year it seems that the male sex predominated, and consequently little harm was done; then, however, the proportions were reversed, the females being estimated as *twelve* to *one*, and hence the extent of the injurious work.

I find the above in the Notes and Memoranda of the "Intellectual Observer." It is to be regretted that a journal devoted to science should make so important a statement in such a slip-shod manner. But assuming that the term "fly" has reference to some Dipterous insect, is it a fact that the males of that order copulate with more than one female? If not, it is difficult to see how a superabundance of females would lead to an increased abundance of larvæ. As a general thing, we know that males of most species, at least in Lepidaptera, preponderate. But we also know, that many species are periodically abundant and then again scarce. Now, is it, or is it not, a fact that this periodical abundance is at all due to the abundance of females of the previous brood? If so, is it possible to trace the law regulating the relative proportion of the sexes? Is the "influence" meteorological? Has the abundance or scarcity of food anything to do with it?

W. V. ANDREWS.

TIME OF THE APPEARANCE OF THE POLYPHEMUS MOTH IN LOUISIANA AND KENTUCKY.—*Covington, Ky., Feb. 20th,* 1870.—It is not very important, perhaps, but for the sake of being "right upon the (entomological) record," I wish to correct an error as to *Polyphemus* and *Chalcis mariæ* in your last number. I thought I had stated—but perhaps I did not—that the specimens of *C. mariæ* were bred from a cocoon of *Polyphemus*, taken in New Orleans, where I spent last February. *Polyphemus* is disclosed there in February, but probably not earlier than the last of May here. Your article conveys the impression that it is disclosed here in February. At New Orleans it occurs by the million on the live oak, and, I think, cannot be very subject to parasites, as from over fifty cocoons I bred the moth, while only one produced the Long-tailed Ophion (*O. macrurum*), and one the *Chalcis mariæ*. Here *Polyphemus* is very rare; more so than *Luna*. I have found in all my excursions around here only one cocoon of *Polyphemus*, and that produced nothing.

V. T. CHAMBERS.

[We differ from our correspondent in the opinion that the matter is not very important. It is of the utmost importance, and we thank him for making the correction.—ED.]

COMPLIMENTARY.

We have good cause to be gratified at the many complimentary notices which our little Journal receives, and though, as before stated, it is of course exceedingly distressing to our modesty to dwell upon such subjects, yet we cannot refrain from laying before our readers the two following items which indicate the opinions of those who are thoroughly competent to judge:

[From Dr. Warder's Address at the late Annual Meeting of the Ohio State Horticultural Society.]

HORTICULTURAL PERIODICALS.—After speaking of the inestimable value of the periodicals devoted to horticulture and kindred subjects, and referring particularly to the *Horticulturist*, of New York, *Gardeners' Monthly*, of Philadelphia, and *American Journal of Horticulture*, of Boston, he said:

"Among all the periodicals, however, there is none more absolutely necessary to the gardener and farmer than the AMERICAN ENTOMOLOGIST, published at St. Louis, Mo., and edited by the Entomologist of that State. From the very practical pages of this journal we may gather hints of the greatest value. This paper is the more valuable and essential to us from the fact that it is the only one of the kind in the country, and because we have no officer in our own State whose duty it should be to supply the needful information to enable us to counterwork our insect enemies, and to protect ourselves from their terrible ravages."

[From the Western Rural.]

USEFUL READING.—During the long nights of winter a great deal of very valuable information may be obtained from standard works on Horticulture, Entomology, etc. Every farmer's library should contain standard works on subjects connected with agriculture and horticulture. There are several very useful books published on Pomology, Grape Culture, Small Fruit, etc. The AMERICAN ENTOMOLOGIST contains a large amount of information about the habits of predatory insects, and the various modes of destroying them, or preventing their increase. It should be in the hands of every farmer and fruit-grower. The precepts learned by the attentive study of the best authors, may have a very beneficial effect when carried into practice in the orchard or garden, at the right time. The damage done annually to fruit by predatory insects is incalculable.

GAPES IN FOWLS.—Much has been written and much is being written about "Gapes in Fowls." Young chickens, especially when they are two or three weeks old, are quite subject to this disease, and if one that has died of it, be examined, several small red worms one-half or three-quarters of an inch in length, and as large as a common sized pin, will be found in the trachea. Some of our subscribers seem to have been sorely puzzled by the contradictory statements found in the different agricultural papers, and appeal to us for information under the supposition that these worms are insects. Thus, speaking of these parasites, Mr. Jas. H. Parsons, of Franklin, N. Y., writes:

"The only theory I have ever seen advanced is that these worms when mature, crawl out of the windpipe, burrow in the earth, change to flies, and then couple and lay their eggs in the nostrils of the chick. The theory is plausible, but whether it has any facts to support it is more than I know. I wish you would solve the problem of the cause and cure of these Gapes."

Again, Thos. W. Gordon, of Georgetown, Ohio, writes:

"Do Gapes in chickens depend upon small worms in the trachea? If so, to what species do they belong? What is their origin, and what is the best known means of destroying them and saving the fowls? Farmers here say the disease is caused by small worms in the throat, and that they lie embedded in mucus, and the chickens can be saved by removing the worms with a horse hair, a stalk of grass, or a small wire; but there are none who seem to be certain of the source of these little destructive pests."

Again, some persons believe the "Gapes" to be caused by the larvæ of insects in the lungs, as the following, from Milton Conard, of West Grove, Pa., will show:

"I have by a post mortem examination ascertained that the 'Gapes' in chickens are occasioned by the *larva* of an insect preying upon the substance of the lungs, and have concluded that the spasms, termed 'the Gapes,' result from the effort of the worm or maggot to escape to the ground, having completed this first period of its existence in the chicken's lungs, where it did much harm to the delicate structure of this important organ. And in tracing the *track* of these unfeeling parasites through the body of the lung, I think I discovered that it originated right opposite the bone cavity under the wing, where there is only a thin membranous partition between the lung and the outer air; and my inference is, that the insect (probably *winged*), by instinct, seeks this point, as affording the means of easily depositing its eggs in the lungs. Now, what I want to know is, what is the character or description of the perfect insect? Is it described in any of the books?"

The worm which causes "Gapes," like that large species (*Strongylus gigas*) which is known to inhabit the kidneys of swine, and even sometimes finds its way into the same organ in man, belongs to the *Entozoa* (*entos*, within, and *zoon*, an animal), a class of animals included in the fourth great Branch or Division of the Animal Kingdom, known as Star-animals (RADIATA). Therefore, since they do not even belong to the same Branch (ARTICULATA) with insects, they do not, strictly speaking, come within our province. But as some recent authorities, and among them Prof. Leidy, of Philadelphia, are disposed to class them with the Articulates, and as with the funguses, the AMERICAN ENTOMOLOGIST seems, by common consent, to be looked to for information about them, we take great pleasure in referring our readers to an article on "Gapes in Fowls" in the present number of our magazine, from the able pen of Dr. N. H. Paaren, V. S., of Chicago, Ills. It must be remembered that none of these intestinal worms undergo any complete transformations as do true insects, and that the suppositions of Mr. Conard and Mr. Parsons are without facts. Prof. Leidy is of the opinion, that, from the destructive character of any of the oils, fixed or volatile, to insects, worms, etc., olive, lard, or other oil, with or without a few drops of turpentine or other essential oil, applied by means of a feather, would be of service in "Gapes;" while the following paragraph from an old number of *Turf, Field and Farm*, speaks for itself:

"A gentleman who has had much experience with poultry, in England, recommends a novel cure. He writes: 'The whole apparatus consists in a thin piece of gut, such as flies are fastened on, coarser for chickens than for pheasants, and tolerably stiff, about from four to six inches long, and fastened at the end of the loop with a piece of sealing wax, by way of handle. Put this gut down the windpipe, twist it round half a dozen times, and you will draw out the parasite that gives so much trouble; repeat the process two or three times, and let the chicken go. From being flexible, no harm is done to the tender tube of the windpipe. Wire kills as often as it cures.'"

☞ As the spring season is at hand, and much may be done in the way of preventing the inroads of noxious insects before the trees put forth their leaves, we make room this month for several communications of a practical nature, and have necessarily had to omit several "Answers to Correspondents."

☞ Now is the time for all those whose subscriptions expire with the first of this year, to renew. Those who appreciate our efforts should strive to send along with their own, the name of some one or other of their neighbors. The effort costs nothing, and besides that satisfaction which every right-minded man feels in imparting to others useful knowledge, there is the reward which comes of having careful neighbors who fight their own insect enemies, and thus make it easier for you to subdue yours.

ERRATUM.—Page 111, column 1, last line but one, for "*Peiris*" read "*Pieris*."

ON OUR TABLE.

THE PUBLIC LEDGER ALMANAC FOR 1870.—G. W. Childs, Publisher, Philadelphia.

THE HERALD OF HEALTH.—Wood & Holbrook, New York.

MONTHLY REPORT OF THE DEPARTMENT OF AGRICULTURE, for November and December.—Washington, D. C.

TILTON'S JOURNAL OF HORTICULTURE.—J. E. Tilton & Co., Boston.

CHICAGO MEDICAL TIMES.—R. A. Gunn, M. D.. and J. E. Hurlbut, M. D., Editors, Chicago.

ONCE A MONTH AND HOME MAGAZINE.—T. S. Arthur & Sons, Philadelphia.

WESTERN EDUCATIONAL REVIEW.—O. H. Fethers, Publisher, Jefferson City, Mo.

SECOND ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE ILLINOIS INDUSTRIAL UNIVERSITY.

NOTICE OF THE CRUSTACEA—Collected by Prof. C. F. Hartt, on the Coast of Brazil in 1867, together with a List of the Described Species of Brazilian *Podophthalmia*.—By Sidney I. Smith, Assistant in Zoology, Yale College, New Haven, Conn. The author has our thanks for this interesting pamphlet.

SOME OF THE HINDRANCES AND HELPS TO THE ADVANCEMENT OF AGRICULTURE.—An Address before the New York State Agricultural Society at Elmira in 1869. By George Buckland, Professor of Agriculture in University College, Toronto.

PRANG'S CHROMOS—A Journal of Popular Art.—L. Prang & Co., Boston. Nothing could be better calculated to awaken and increase the interest of the public in Prang's celebrated Chromos than the attractive publication before us.

THE HORTICULTURIST.—This old established monthly has rapidly increased in interest since under the charge of its present editor, Mr. H. T. Williams. We heartily welcome it to our table, and admire the spirit and ability with which it is conducted.

THE WESTERN POMOLOGIST—A Monthly Journal of Horticulture and Floriculture.—Published at Des Moines, Iowa. Mark Miller and J. A. Nash, editors. The first number of this new monthly lies on our table. The field it proposes to occupy is a wide one, and is to a certain extent unoccupied. Mr. Miller's experience as an agricultural editor, and as a practical horticulturist, eminently fit him for the position which he assumes.

THE AMERICAN NATURALIST.—No. 11 of this excellent monthly is at hand, and the next number will complete the third volume. The editors are performing a labor of love, and strongly appeal to the naturalists of the country to give the magazine that support which it well deserves. The subscribers to the ENTOMOLOGIST who are interested in other branches of natural history, cannot do better than club with the *Naturalist* in renewing their subscriptions, as a liberal discount is made. The new volume is to open with an illustrated article on the Ancient Megalithic Monuments of Peru compared with those of other parts of the world, by the eminent archæologist E. G. Squier, and with another on Sponges, by Prof. Jos. Leidy, of Philadelphia.

THE COUNTRY GENTLEMAN.—Luther Tucker & Son, Albany, N. Y. With the beginning of the new year this sterling paper was enlarged, and the old heading was exchanged for one more beautiful and becoming. The Country Gentleman has no superior as a strictly agricultural paper, and we take this opportunity of thanking the editors for the many kindly notices they have given of the ENTOMOLOGIST; and to assure them that their good will is appreciated.

THE PRAIRIE FARMER.—This old stand-by of the western farmer still continues to improve, and we rejoice in its success. With the new year it donned a new and improved dress, and it now appears more attractive than ever. The publishers have also engaged a special draughtsman and engraver, and more attention is to be paid to the illustrations. The price is but $2.00 a year, and every new subscriber gets a copy of the Prairie Farmer Annual, while every one sending two names and $4.00 receives a beautiful allegorical lithograph, entitled "The Farmer pays for All." The Prairie Farmer ($2.00) and the AMERICAN ENTOMOLOGIST ($2.00) can be had for $3.00 by parties sending for both papers at one and the same time.

VICK'S ILLUSTRATED CATALOGUE AND FLORAL GUIDE FOR 1870.—Mr. Vick has our thanks for this beautiful pamphlet, which eclipses all former catalogues. Every lover of flowers should send to Jas. Vick, of Rochester, N. Y., for a copy.

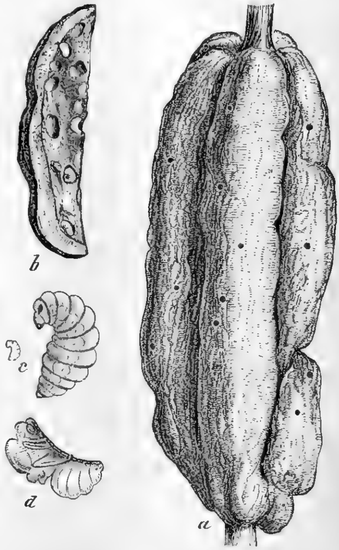
MICHEL BROS. & KERN'S FLORAL CATALOGUE. —Just as we go to press this catalogue reaches us, and we have not the space to give it the extended notice it deserves. We hardly supposed that anything so creditable could be gotten up in the West, and Mr. Vick will soon have to look to his laurels, lest he be outdone, in the catalogue business, by some of our Western friends. We can confidently recommend the above firm to those of our readers who wish anything in the floricultural line that is thoroughly adapted to the Mississippi valley; for we have long admired their strict integrity and courtesy.

ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent, are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain, whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

Pithy Blackberry Gall—*S. C. Spaulding, Rose Hill, Mo.*—The woody blood-brown gall found on

[Fig. 103.]



Colors—(*a*) blood-brown; (*b*) yellowish-green; (*c* and *d*) white.

Blackberry canes, over three inches in length and divided longitudinally into five pretty regular ridges, is the common Pithy Blackberry gall, caused by the Misty Gall-fly (*Diastrophus nebulosus*, O. S.) This gall was first described (Proc. Ent. Soc. Phil., II, p. 36) by Baron Osten Sacken. Its shape varies, but there are always four or five of the wrinkled ridges more or less traceable along the stem (Fig. 103, *a*), corresponding to the rows of punctures which the female made in depositing her eggs. It is really a deformation of the cane, chiefly due to a hypertrophy of the pith in consequence of the poison injected at the time of depositing. If a longitudinal section is made, the inside will present the appearance of Figure 103, *b*, the flesh being insipid in taste. Near the edge the flesh in the fresh specimens is soft and green to the depth of about one-quarter inch, contrasting strongly with the yellow, pithy and woody interior, in which are found the cells, which vary in form from perfectly round to oblong-oval. At the present time the larva (Fig. 103, *c*)—which when straightened out measures 0.11 inch, and which is white with the mouth parts, an oval spot each side just behind the head, and the breathing holes, rufous—may be found lying curled up in its cell; but towards the end of March it gradually transforms to pupa (Fig. 103, *d*), and the fly, in your latitude, issues about the first of May. This fly belongs to the *Cynips* family, but to the genus *Diastrophus*, which is confined to plants of the Rose family just as *Cynips* is to the Oak family, and as *Antistrophus*, described on page 74, is to Composite plants. If you should keep one of these galls in a closed vessel till next summer, you would doubtless breed from it, besides the true gall-maker, a guest-fly or intruder (*Aulax sylvestris*, O. S.) which sponges on the *Diastrophus* for board and lodging, and a little parasitic *Chalcis*-fly which serves to keep the gall-maker in check. By burning these unsightly galls at this season of the year, you of course effectually prevent the increase of the insect which produces it.

Clover-worms—*G. Pauls, Eureka, Mo.*—You say: "In opening a stack of timothy hay, in which there was a little clover at the bottom of the stack, I found a lot of brown, grayish worms, that had nearly eaten all the clover, but not the timothy. I wanted to compare them with your description of the Clover-worm, but the number of the ENTOMOLOGIST containing it was not at hand. Are they the same thing?" Yes, they are the identical "Clover-worm"—the only "Clover-worm" known to prefer the dry to the green plant, and a winter to a summer existence! This is the first time we have heard of it in Missouri, though from having caught numerous specimens of the moth in St. Louis, flying at the light during the summer nights, we knew that the worm must also occur not far off. The answer you refer to will be found on page 226 of the last volume, where figures are given of the insect in all its stages. This insect is very widely distributed, occurring in many parts of Europe, in Canada, as we are informed by Mr. C. J. S. Bethune, and in most of the Northern and Middle States of the Union. This is not to be wondered at, when we know how very easily it may be transported in the larva state in clover hay. Yet, common as it is, nothing was known of its larval history till we published an article on the subject in the *Prairie Farmer* of Chicago. It would really be interesting to know whether or not this insect has the same habits abroad as it has with us, for we cannot believe, as stated by Humphrey, that it feeds on poplars in England. In the *Prairie Farmer Annual* for 1868 we published the following relative to its proper nomenclature:

"Attacking and spoiling clover in the stack and mow, by interweaving and covering it with abundant white silken web, and black excrement that much resembles coarse gunpowder.

"Full accounts were given of this insect, first in the *Prairie Farmer* of April 20th, under the name of *Pyralis olinalis*, and corrected in the following issue to *Asopia costalis*. It is only left to state that from all we can learn, this latter is the proper name. The two insects are remarkably alike, and easily confounded, though the *olinalis* is confined to the United States, while *costalis* occurs both here and in Europe, no difference having been found between our American species and those of Europe. Both of them have been recently referred to the genus *Asopia* by a distinguished European Lepidopterist, in monographing the family PYRALIDÆ, to which they belong; though the differences between *Asopia* and *Pyralis* are very trivial indeed, and to our mind there is no *real* reason why our insect should not still be included in the latter genus, where Fabricius first placed it. Our Clover-worm, with its synonyms, may be given thus:

"ASOPIA COSTALIS, Lederer.
"*Pyralis costalis*, Fabr.
"*Pyralis fimbrialis*, Steph.

"The student of Entomology is eternally harassed and perplexed by the many synonyms attaching to one insect, every modern monographer dividing up the old genera, till we have almost as many as we have species; and we sometimes wish that, instead of a hundred different persons, in as many parts of the world, each cutting up the old genera and creating new ones, according to his particular idea, we could look to some universally recognized head, such as our American Entomological Society, for some jurisdiction and authority in this matter of classification.

"The only figure we are able to find of this moth, is in Vol. I, pl. 45, fig. 18, of 'The genera of British Moths, arranged according to the plan now adopted in the British Museum, by H. Noel Humphrey;' where it is called *Hypsopygea costalis*, and the caterpillar is said to feed on poplars. The lithographs, however, are more faithful than the author's pen, for in his text he most laughably confounds this insect with the common meal moth, *Pyralis farinalis*.

"The simple 'Clover-worm' will, of course, fall far more pleasing and significant on the farmer's ear than these synonyms, but they are given for those who take an interest in such matters."

Since the above was published we have added to our library several valuable works on moths; and we find that, up to a quite recent date, both the leading French and English authors place this moth in the old Linnean genus *Pyralis*. The moth is popularly known in England as the Gold Fringe.

By making a good elevated foundation for your clover stacks, so that the air can pass underneath, and by sprinkling the first few feet with salt when building the stack, you will effectually preserve the hay against the attacks of this worm.

Seed Ticks under Bark of Apple-trees—*O. B. Galusha, Morris, Ills.*—The minute 8-legged "insects" which infest the apple trees in Mr. Clapp's orchard, harboring under the outer bark, are in reality not true insects. No insect has more than *six* true legs, and though the larvæ of most Moths and Butterflies [order *Lepidoptera*], of Saw-flies [order *Hymenoptera*], of some Two-winged flies [order *Diptera*], and many beetles (order *Coleoptera*), possess from one to sixteen additional legs, yet all over the six anterior ones are simply membranous or prop-legs, and are lost when the insects attain their perfect state. Thus whenever you find an animal with eight true horny, jointed legs, you may safely conclude that it is not an insect. The little animals you sent, were in fact "seed-ticks," the young of one of our most common wood-ticks (*Ixodes unipunctata*, Pack).* When recently hatched these ticks have but six legs, but they very soon acquire the additional pair. We do not think they will do any serious harm to the trees, and should judge that they do not occur very generally over the orchard.

Parasitic Cocoons—*S. W. Beckworth, South Pass, Ills.*—The "nest of eggs" which you send, and which you found near your door yard under some Red-oak trees, are in reality the same kind of little parasitic cocoons, spoken of, and figured on page 128 of our last number, in answer to G. C. Brackett. Of course they should not be destroyed.

Ticks and Texas Fever—*Thos. W. Gordon, Georgetown, O.*—See what we have said on this subject on page 28 of our first volume.

*Guide to Study of Insects, p. 661.

THE AMERICAN Entomologist and Botanist.

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Entomological Department.

CHARLES V. RILEY, EDITOR,
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THE BOTANICAL DEPARTMENT.

Our readers, no doubt, will be a little surprised, upon receiving this number, to notice the change in our title, and in the appearance of our cover. Well, we confess that we are fond of giving these little surprises, for which reason we have never even so much as hinted at this change, which we have long since had in view. Now, kind reader, how does the change suit you? You may be sure that it pleases us, or we should not have made it, and we can imagine an almost unanimous expression of pleasure from the fairer portion of our subscribers, as well as from the great majority of the sterner sex.

The success of the ENTOMOLOGIST in directing attention to the pleasure and importance of the study of Insects, especially of those affecting the interests of Agriculture and Horticulture, has been highly gratifying; and though there is often much truth in the trite French aphorism "*le mieux est l'ennemi du bien*," yet we should make no true progress in this world, if we adhered to it too strictly.

The two sciences of Entomology and Botany go hand-in-hand; they are, indeed, twin-sisters, and we have often thought, and the matter has frequently been suggested by friends, that the usefulness of our Magazine might be increased by broadening and extending its sphere of operation so as to include a department of Botany. To us there is no branch of Natural History so captivating as Entomology, but lives there a field-entomologist who has not, over and over again, admired the varied and beauteous forms of plant-life around him, or who has not been impressed a thousand times with the absolute necessity of some knowledge of Botany to enable him to fully carry out his own studies? We trow not!

It would be difficult to determine which of these two branches of Natural History has the greatest number of devotees amongst the priesthood of Science; but it is very evident that Botany has the greatest number amongst the laity. For while the tender flower develops the æsthetic part of man's nature, and draws out the sympathy of every child, the poor despised bug creates an equal degree of repugnance in the popular mind. This popular state of mind is owing principally to the fact that the eyes of but few have yet been opened to the hidden wonders and beauties of the Insect World. We know that there are hundreds of persons who will subscribe to a journal devoted to Plants, but who would never think of taking one devoted to Bugs, and if by the change we have inaugurated, additional readers are brought to our Journal, and a few only of them learn to appreciate the more generally despised of God's creatures, we shall have accomplished a double purpose.

The field of Nature may be likened to a vast Museum, where one may enter and view the most wonderful objects, and find on emerging that the great mass has left but an indistinct and confused impression on the mind. But if a guide go with us and direct our attention in detail to the many curiosities, and point out their peculiarities, we shall find those objects indelibly stamped upon the memory. Now if, while striving to enhance the prosperity of the country, by describing, figuring, and suggesting remedies for the different insects which often blight the hopes of the producer, we can at the same time engage attention and study to the Vegetable Kingdom, which is so very intimately connected with the existence and comfort of the human family, we shall feel that we are effecting increased benefit.

It is with great pleasure, therefore, that we introduce to our readers Mr. Geo. Vasey, of Richview, Ills., who will furnish from eight to twelve pages of botanical matter each month. Mr. Vasey has long been known in the West as an eminent botanist, and his reputation is a sufficient guarantee of the ability with which that department will be conducted. But we leave him to lay his own plans before the reader. All letters on botanical subjects should be addressed to Mr. Vasey, at Richview, Ills., and all those on entomological matters, as usual, to the writer, C. V. R.

WHEAT RUST AND BARBERRY RUST.

The article on page 85 of our present volume, entitled "A so-called 'Vulgar Error' no Error at all," has called forth the following paragraph from the *Country Gentleman:*

A SINGULAR INCONSISTENCY.—We have repeatedly commended the *American Entomologist* for its common sense and scientific accuracy. It has always been severe on the superficial errors of the day. But in a late number, it has somewhat deviated from this general course, and endorsed the opinion that the barberry causes rust in the wheat—although this opinion is not sustained with a tenth part of the witnesses who assert that wheat is transmuted to chess. We never saw finer and fairer wheat than grew in immediate contiguity to barberry bushes, and in addition to this, the article in the *Entomologist* expressly quotes the statement of S. E. Todd, that "he had seen the finest crops of wheat growing close beside the bush spoken of."

All which is as much as to say that they (the editors of the *Country Gentleman*), do not believe that the barberry causes rust in wheat, and that we ourselves have fallen into one of the superficial errors of the day. Very well, gentlemen, you have a perfect right to your opinion, but when you assail that of others, you must stand ready to defend your own. We throw down the glove, and if you wish to pick it up, you will find us ready! This fungus question does not properly come within our province, and we freely confess that we do not even know the A B C of the science of mycology; but we are always ready to defend any position we have assumed, and will freely "confess the corn" whenever it shall be shown that we are in the wrong. We write for truth and not for victory, and in the present case we have taken up the cudgel in defense of the plain, practical farmer, because we feel quite confident that for once he is in the right. Nor have we based our belief upon any experience of our own, but upon the authority of Professors De Bary and Œrsted, and of Sir Joseph Banks, to whose conclusions, founded on experiment, we beg leave to give the preference over all the opinions, assertions and asseverations, not so founded, that ever were or ever will be thundered forth. Consequently the *Country Gentleman*, in the above-quoted item, in reality makes no charge against us, but disputes the veracity, and questions the ability and scientific accuracy of the authors named. It has been demonstrated by Œrsted that a certain fungus (*Podisoma sabinæ*) infesting the branches of the Savin, is but a phase of another (*Rœstelia cancellata*) which attacks the leaves of the Pear; that one (*Podisoma clavarisforme*) which occurs on the branches of the Juniper is but the first asexual state of *Rœstelia penicillata*, which manifests itself on the leaves of the Apple and White Thorn; and finally, that *Podisoma juniperinum*, which also inhabits the leaves and branches of the Juniper, is identical with that of *Rœstelia cornifera*, which infests the leaves of the Mountain Ash. Does the *Country Gentleman* likewise dispute the correctness of these physiological discoveries?

We know that ever since this matter was first discussed, in 1774, it has been the fashion to deride the common belief of the farmer, and singularly enough this fashion has prevailed to the greatest extent with those who passed most of their lives amid piles of brick and mortar. We are all too apt to follow in other people's footsteps, and to believe too implicitly what we were taught in childhood; and there always will be men who prefer to accept the fossilized and crude ideas entertained hundreds of years ago, rather than to make investigations and think for themselves. But this is pre-eminently an age of progress, and we find that many a dogma which for years may have had supreme hold of the public mind, has been shattered, so to speak, by modern investigation. Many an idea that was scouted as ridiculous and absurd but a decade since, is now accepted as a truth, and the discoveries that have been made during that time have convinced every candid and earnest naturalist, that life, whether animal or vegetable, is altogether more plastic and protean than was formerly supposed; and the lower down in the scale we go, the more shall we find this to be true.

As a striking and familiar example, we may mention that the *Hydra tuba*, *Scyphistoma*, *Strobila* and *Ephydra* were supposed by superficial observers to be perfectly distinct and different animals, till they were all proved by experiment to be but different forms of the common Jelly-fish or Medusæ; and hundreds of similar cases among the lower plants and animals might be cited, some even, as we have already shown, where the different forms of one and the same species have been ranked as distinct genera. It is only since a comparatively recent period that by aid of our much improved microscopes, the rusts and moulds have been properly studied. W. P. Schimper, in 1848, in his *Recherches sur les Mousses*, established, by experiment, that the so-called *Confervaceæ* are the pregerminal phases of the leaf-mosses, notwithstanding which, they are yet very generally considered as sea-weeds or *algæ*, under a spurious nomenclature. Again, each of the phases of the fermentative or original zymotic fungus have been separately named by those who have paid no attention to its development, as has been demonstrated by Prof. Hallier, of Jena, Germany, and by Dr. Hilgard, of this country; while the bread and preserve moulds, the blue moulds on apples and lemons, the cheese and stool ferments have all been proved to be but different forms of one species, by the latter gentleman. In our own special department we might mention several instances where closet-entomologists, with a supreme contempt for larval or pupal characters, have fabricated two, three or more species out of what upon more profound knowledge have proved to be one and the same.

Is it to be wondered at, therefore, with these facts before us, that we prefer, rather than accept the *ipsissima dicta* of would-be *savans*, to take the testimony of men who, having devoted years to the study of funguses, announce that the Red rust in wheat is but a form or stage of the common Barberry rust.

We attach more importance to a single fact, based upon well conducted experiment, than to ten thousand theories and "opinions" that have no facts for their support, though they may be acquiesced in by the so-called authority throughout the land. We always intend to be "severe on the superficial errors of the day," and are especially down on scientific charlatanism. We have the highest respect for our friend and correspondent, Dr. Trimble, of New Jersey, but when, in speaking on this barberry-wheat question, he simply asserts that "this is an old tradition that I have heard from a boy, but there is no foundation for the belief"; and that "rust is produced by another class of causes"—without explaining what those causes are—his words sound too much like hollow assertion, unsupported by facts. Such words from the Doctor appear the more astonishing to those who have watched his strenuous efforts to overthrow another superficial error, by demonstrating that on some soils shallow plowing is to be preferred to deep plowing, notwithstanding the latter has from time immemorial been urged and recommended, without qualification, by *all* theorists.

But we will not dwell any longer on this subject at present. We have long since admired the courtesy and ability with which the *Country Gentleman* is conducted, and feel that the criticism we have quoted, was made in all candor. Calm and dispassionate argument and controversy usually results in good, and if our Albany friends will bring forth any argument that is worthy the name, in favor of their position, we may in future consider this matter at greater length, and perhaps get our Botanical Editor to give us his opinion, as it is really a botanical matter.

We shall defend the farmer whenever we think he is in the right, for as in the old Fable of the Printer and the Lion, the scientific artist in the city who is every day publishing descriptions of men conquering lions in fair single combat, has a great advantage over the poor maligned agricultural lion in the country, who publishes nothing at all, and confines himself to the plain, practical occupation of gobbling up as many men as he can possibly get hold of.

Whether or not the opinion that *Puccinia graminis* and *Æcidium berberidis* are the alternate generations of one species, is "sustained with a tenth part of the witnesses who assert that wheat is transmuted into chess," is a question entirely foreign to the subject, the wheat-chess discussion having absolutely nothing to do with that of Wheat and Barberry rust. And as to the opinion that Barberry can not cause rust in wheat because fine wheat has been grown in close contiguity to such bushes, it sounds too much like assuming that small-pox is not contagious because a certain unvaccinated person, living in a house where the disease prevailed, escaped without catching it; for as we may learn from the perusal of DeBary's pamphlets*, a certain condition of the atmosphere is necessary to the proper germination of the Wheat-Barberry fungus. Moreover, we have never assumed, nor will any sensible person ever assume, that healthy Barberry bushes, free from rust, will produce any rust in wheat.

*Neue Untersuchungen ueber Uredineen, insbesondere die Entwicklung der *Puccinia graminis*. A. DeBary, Berlin, 1865. Zweite Mittheilung, 1866.

"There is no branch of Natural History so captivating as Entomology, and certainly none so easily gratified; for its pursuit brings us into immediate relation to Nature in her most attractive dress, in the woods, the fields and the gardens."—*Morris*.

Erratum.—Page 97, over the illustration, for "Fig. 59," read "Fig. 59½."

IS ANY KNOWLEDGE USELESS?

"There is no name of greater power at the present day than that of Science; and it is as awkward to say anything against the pretensions of men of science as it once was to be a heretic of a different order. You cannot, it is true, be burnt alive, or put into an inquisition, but, which is almost as bad, you can be made to look extremely foolish. The men of science regard you through their spectacles with an air calculated to strike terror into the boldest heart, if you venture to question the advantage of their most trifling speculations. Any thing which by hook or by crook can be brought under the mantle of an ology is a sacred object, not to be touched by the profane vulgar. A poor savage sees a civilized being, capable of producing thunder and supplied with unlimited quantities of fire-water, devote himself for years to the pursuit of bugs—using that word in the American sense. This strange creature will live for months in a wilderness, and be amply rewarded by collecting a boat-load of creeping, crawling things, which are not even good to eat. The savage thinks the white man must be little better than an idiot; and the white man, when he comes home, writes his book, and holds the savage up to the derision of an enlightened public. 'Here,' he says in effect, 'is a poor creature so ignorant as to think me a fool for spending a month in discovering the *Hotonchrononthologus Jonesii*—an animal which differs from all other Hotonchrononthologi in having two more spots upon his nose, and an extra claw on his hind leg.' Is it so plain that the white man has altogether the best of the argument? Suppose that the beast in question had remained unknown, would the human race have been materially the worse? Or, to put it more moderately, could not the month be spent to more purpose in some other field of labor? Some distinguished martyr to science once planted a colony of some loathsome insect in his thumb, and heroically traveled to Europe with his burden, in the hope of discovering some new facts about the way in which the animal laid its eggs. Unluckily, if I remember right, the thumb mortified and had to be amputated within sight of land; and we have ever since been called upon to admire the zeal and heroism of the sufferer. I am willing to do so, just as I admire St. Simeon Stylites for standing for twenty years on a column, and saying his prayers one thousand two hundred and fourty-four times a day. Only I cannot help asking, in each case, whether so rare a quality of heroism could not have been turned to some better account? Zeal is not a commodity of which we have such an abundance that we can complacently set it running to waste. Science often means nothing more than accurate and systematic knowledge of facts; and the question always remains whether the facts are really worth knowing. If a man of genius spends years in investigating the habits of a microscopic animalcule, it does not follow that the game was worth the candle simply because we give to the knowledge gained the mystic name of science."

We quote the above because it gives a fair idea of the views of those practical men whose sphere of mental vision is circumscribed by the question *cui bono?* in other words, men whose minds, if placed in the centre of a good old-fashioned silver dollar, would be entirely contained within the periphery.

The great value of most scientific facts lies not so much in the practical availability of the facts as in the correlation with other facts, and the light which they throw upon scientific questions of confessedly high importance. The discovery of the supposititious *Hotonchrononthologus Jonesii* might not be a matter of much consequence in itself, but its relation to the Darwinian hypothesis, and its effect upon our views in regard to species, might possibly be so important as to immortalize the discoverer. So, too, it might not be a matter of much consequence in itself how a certain *Acarus* propagated its species; but a study of the process in this particular case *might* throw much light on generation in general, and this is certainly worth the expenditure of a good deal of zeal and labor. Full and definite knowledge of any subject is only to be attained through long study, and by examining the question from every point of view, and under every variety of circumstance and condition. The processes of generation carefully investigated in the lower animals, have thrown great light on the corresponding processes involved in the reproduction of those of higher grade. Success in the breeding of domestic animals depends largely upon our knowledge of the causes that govern the variations of species and varieties. It is not at all impossible, under certain contingencies, that a mere dot on a fossil shell, buried millions of years ago, might decide important questions in this connection, and lay the world under everlasting obligations to the observer of these minute differences. The writer of the paragraph we have just quoted evidently does not appreciate the fact, that every thing in Nature is carried out strictly according to law, and that the most trifling fact is valuable as an index to these laws.

We copy the foregoing, with the able comments of the editor, from the November number of the *Manufacturer and Builder*. We rejoice that there are few persons, even amongst those so-called practical men who hate the very sight of a Latin word, who take such a narrow-minded view of true science; and that their numbers are fast diminishing. It is entirely unnecessary for us to undertake to show how most of those discoveries which have in a great measure brought about our present advanced civilization, have been made by the study of "small things," and by the "accurate and systematic accumulation of facts." But to show how, in our own Department of Science, the knowledge of a single fact which can only be obtained by a proper study of one of these "insignificant" creeping, crawling things, that are popularly called Bugs, may prove of great practical importance, let us instance one or two of the many cases that might be brought forward.

It is well known that elm trees, as well as apple trees, in certain localities in the United States, are sometimes eaten almost bare by that common looping caterpillar called the Canker-worm; and that these worms have been checked and controlled by those who are acquainted with their peculiar habits, by fastening leaden troughs of oil round the butts of the trees. Like the larvæ of many other moths, this worm buries itself under the ground to change into the pupa state; but unlike the great majority of moths, the perfect male has wings, and the perfect female has no wings at all, and is therefore compelled to crawl up the trunks of the trees to deposit her eggs, instead of flying on to the trees, as almost all other insects have the power of doing when in the perfect state. Hence the philosophy of the practice above alluded to, which depends for its efficacy on this trait in the natural history of the Canker-worm. Not very long ago, the elm trees which ornament the city of Baltimore were attacked by a larva that stripped them bare. Supposing it to be the notorious Canker-worm, the corporate authorities spent a good many hundred dollars in fixing leaden troughs filled with oil, after the most approved fashion, round their trees. They might just as well have built a tight board fence round a corn-field to keep out the crows and blackbirds. The insect that was afflicting their trees was not the Canker-worm, but the larva of a beetle (*Galeruca calmariensis*) imported by some chance or other from Europe, where it often strips the elm trees in the same way; and, unfortunately for the City Fathers of Baltimore, the female of this beetle has wings, and was not in the least inconvenienced by the oil-troughs. A little time spent in investigating the habits of this beetle would have saved them all their trouble.

A similar instance of just such entomological folly occurred a couple of years ago in Southern Illinois. A certain fruit-grower in Union county, for lack of a proper knowledge of the habits of that little pest the Curculio, took it into his head that this insect had no wings and could not fly, and that it could only reach the fruit, in consequence, by climbing up the tree. Hence he very sapiently went to work and fixed a band of wool around every tree in a large orchard containing about 10,000. Now, as the Curculio has ample wings, and can fly with the greatest ease, this procedure was of no earthly use in protecting this worthy fruit-grower's peaches. He might just as well have wrapped the wool round his stove-pipe under the delusive idea that he could thereby keep the flies and mosquitoes out of his house.

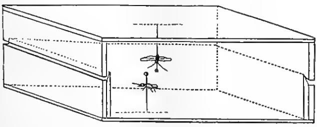
There is a small timber-boring beetle—called *Limexylon navale*, or in English the Naval Timber-pest—which is very common in the Oak forests of the North of Europe, and occasionally occurs in such numbers in the Swedish and French dock-yards, as to do a prodigious amount of damage. About one hundred years ago the Swedish Government found out that this insect was doing millions of dollars' worth of damage in their dock-yards by boring the timber full of holes, so that if it had been put into a ship, it would have let the water in like a sieve. The Swedish Government concluded that it wouldn't answer to incur such a heavy annual loss; and they did the very wisest thing that they possibly could have done. They applied to the celebrated Linnæus—the father of the Science of Entomology—though to many perhaps he is only known as a great Botanist. Linnæus took the matter in hand, and having investigated the habits of the insect, discovered that it came out of the timber in the perfect or winged state in one particular month only (June) when it flew around, paired, laid its eggs on any oak timber to which it had access, and shortly afterwards perished. So he said to the Swedish Government: "Gentlemen, all you have to do is to sink all your oak timber under water during the month of June, so that the female beetle may not be able to deposit her eggs on it; and you will be no more troubled for a great many years to come with *Limexylon navale*." The Government did so; and the result was just what Linnæus had predicted. Dr. Harris informs us that not very long afterwards the insect occurred in similar profusion in a French dock-yard; and although a naval officer, who was also a good entomologist, suggested the Linnæan remedy to the authorities, they neglected to apply it—having perhaps the common unfaith in Science, and thinking with the vulgar, that the study of bugs was all a humbug. As might have been expected, they reaped the reward of their ignorance, and suffered an immense amount of valuable timber to be destroyed by this insect, which might just as well have been saved.

Such instances might be multiplied *ad infinitum*, but we forbear, and take consolation in the fact that a new era is dawning. There were men who had no faith in Fulton and his Steamboat. There were men who had no faith in Morse and his Electric Telegraph. There were men who had no faith in Stephenson and his Locomotive. But if Fulton, and Morse, and Stephenson, had themselves had no faith, or had suffered themselves to be laughed down by the criticisms of the would-be wits and can't-be philosophers, the world would not now be where it is. The law of the age is progress. "The point that yesterday was lost in the dim far away distance, becomes our goal to-day, and will be our starting point to-morrow."

HOW TO COLLECT AND STUDY INSECTS.

BY F. G. SANBORN, BOSTON, MASS.

[Fig. 104.]



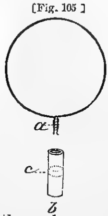
A collection of specimens of insects is an almost indispensable adjunct to the study of the science of Entomology. The simplest and most economical method of obtaining one, but that requiring the greatest amount of time and perseverance, is to preserve each and every object related in any way to the history and transformations of insects. The manner of preserving these varies according to the nature of the substance, and different circumstances may necessitate the use of different means. I propose to give some account of those methods which have been found most desirable.

Presupposing that the object of the student is to make himself acquainted with the natural history of his own locality—whether of State, county, or town—he should provide himself with a number of boxes, of well seasoned wood, of such form and size as will allow of their being conveniently duplicated from time to time as his collection increases. Half a dozen boxes of clear, soft pine, measuring nine or ten by twelve or fourteen inches, and double the length of the common insect pin, that is to say, three inches or three and a quarter, inside depth, so that the specimens can be pinned in both the upper and under box, will be found sufficient to commence with. (See Figure 104.) A flange, or rabbet, extends completely around the interior of the lower box, so as to protect the contents from dust, and prevent the cover from slipping to either side. This should not be more than half an inch in height above the level of the edge of the box, but should fit accurately to the sides and bottom, and be fastened firmly by nails, or nails and glue. If hard or knotty wood is used for the top and bottom of the box, it will be necessary to line or cover these surfaces with some soft material. Considerations of economy or convenience will suggest the use of various substances for this purpose. Many persons insist upon the use of flat sheets of cork glued or nailed to the wood. The pith of the American aloe, or elder, or of broom-corn, are approved of by many collectors. That of Indian corn, unless deprived of its saccharine matter by boiling or otherwise, is less applicable in the long run, on account of its tendency to oxidize or corrode the pins, so that they soon become weakened and break at their points of contact with the pith. Boiler felt, as it is called, composed of cow's hair loosely felted together, has been found very useful, when covered with thin white paper, for lining boxes. Its advantages are, evenness of texture, softness and cheapness, a box of the size above mentioned requiring about ten cents worth of felt. The inch thick felting should be split (which may be easily done with very little practice) and heavy weights be placed upon it when glued into the box, remaining for about forty-eight hours; a plunger of planed board, about a quarter of an inch smaller each way than the box, intervening between the weight and the paper which covers the felt.

Boxes of this size and shape are far preferable to cabinets of drawers, both on the score of economy and convenience, especially for constitutionally erratic American students, as they can readily be packed in small compass for transportation when the collector strikes his tent.

Having prepared a safe place of deposit for the specimens, now let the student construct a "net," by making a loop of strong iron or brass wire, of about 3-16ths of an inch in thickness, so that the diameter of the loop or circle will not exceed twelve inches, leaving an inch to an inch and a half of wire at each end bent at nearly right angles. Bind the two extremities of the wire together with smaller wire (Fig. 105, *a*), and tin them by applying a drop of muriate of zinc, then holding it in the fire or over a gas flame until nearly red hot, when a few grains of block tin or soft solder placed upon them will flow evenly over the whole surface and join them firmly together. Take a Maynard rifle cartridge tube, or other brass tube of similar dimensions; if the former, file off the closed end or perforate it for the admission of the wire, and having tinned it in the same manner on the inside, push a tight fitting cork half way through (Fig. 105, *c*), and pour into it melted tin or soft solder, and insert the wires; if carefully done you will have a firmly constructed

[Fig. 105.]

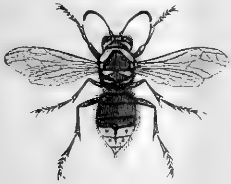


and very durable foundation for a collecting net. The cork being extracted, will leave a convenient socket for inserting a stick or walking cane to serve as a handle. The net should be made of "millinet," "book muslin," or "mosquito bar," as is most convenient; it should not exceed two feet in depth, and will prove much more durable if the wire be bound with cloth or leather, to which the muslin may be sewed. If the loop be made of the dimensions above suggested, one yard of material will suffice for the net. One or more small boxes of two inches depth, lined with pith, to carry in the pocket; a paper or cushion of pins, and a wide-mouthed vial of alcohol, will complete this inexpensive outfit for the collector. Various circumstances will suggest modifications or improvements in the apparatus.

In the next paper we shall endeavor to give an acount of some of the objects to be collected.

THE BALD-FACED HORNET.

[Fig. 106.]



Colors—Brown-black and cream-yellow.

There are few insects more interesting than the wasps; and though some of the family are greatly abused for their depredations in the fruit line; yet I have little doubt that their offending in this, is much more than compensated for by the immense amount of grubs and flies destroyed by them to feed their young. It must be confessed, though, that the way in which they "clean out" a Green-gage or Apricot is "beyond anything," leaving nothing within but the suspended stone; the glowing skin hanging beautiful as ever, but, like some other beauties, terribly empty.

It cannot very well be denied that the wasps were the first paper-makers. As their manufactories were, it is to be presumed, in full blast long before there were any rags, they use wood instead, and produce from it, if not what we would call a first-class, certainly in every way a very creditable, article of paper.

The Bald-faced Hornet (*Vespa maculata*, Linn.), is a remarkable species, entitled to much mention for its beauty and grace, as well as other qualities. I do not know how far northward its range extends; but I have met with it on Lake Superior, where it is abundant and of a large size.

I was much amused there one day, in the month of August, while at work in my tent, watching these Bald-faced Hornets on their foraging expeditions, catching flies to feed their young. The easy grace with which they capture a fly while on the wing, is truly wonderful. To select a fly and pounce on it, dexterously seizing it, is the work of an instant. The wasp then alights, and prepares its victim for transportation, trimming it by cutting off the limbs, as superfluities which would encumber the returning flight. One by one drop down the slender legs of the fly, and the gauzy wings flutter away, as neatly nipped off as though done with tiny scissors. Next, proceeding to roll the denuded fly into a compact parcel, or rather pellet, the wasp moistens it with its saliva for this purpose, and, finally, flies off suddenly and rapidly to its nest with its prey.

This wasp is one of the "Paper-makers," and is the largest of our species. Though its general color is dark brown, almost black, the face, as the English or popular name implies, is white, and the thorax and abdomen are also beautifully marked with curiously-shaped bands and spots of the same creamy or yellowish-white. (See Fig. 106). I have noticed considerable variation in these, particularly in their shape.

One thing appears strange in the proceeding just narrated. From the very first moment of its seizure by the wasp, the fly seems perfectly resigned to its fate, not making the least resistance or even motion, so far as I observed, or the usual buzzing cry it utters when captured by a spider. This would appear to indicate that it is stunned or paralyzed by the wasp. And did we not know that this wasp feeds its larvæ daily, we might be led to consider this a case of paralysis or suspended animation—the prey being laid away for future use.

My tent being "filled with flies," as soon as the wasps found their way into it, they went briskly to work, flying to and fro on their murderous errand. The systematic way in which they performed it was almost laughable; though I could not help feeling that what was fun for me was death to the flies. The strength and determination evinced by the wasps in this, and also in collecting and preparing the material for their paper cells, are truly remarkable. I have seen them strip off, for this latter purpose, the weather-worn splinters from the wood of an old house, all day, with laborious zeal, flying off with pieces marvellously large, considering the size of the insect and the distance to be travelled.

I once found in the woods, on the north shore of Lake Michigan, a wasp's nest nearly twice as large as a man's head. It must have been of unusual age, and the musk-like odor exhaled by it was rather offensive. This was the largest nest I ever saw. The smallest I have ever met with was about only two inches in diameter, though perfect in every respect.

HENRY GILLMAN.

DETROIT, MICHIGAN.

INSECTIVOROUS HABITS OF THE PRAIRIE LARK. (*Alanda alpestris.*)

BY DR. WM. LE BARON, GENEVA, ILLS.

It is still a matter of dispute whether birds, upon the whole, are the friends or the enemies of the husbandman; whether they do more good by devouring noxious insects, than damage by the destruction of fruits and seeds. Happily for the birds, the preponderance of opinion, and still more the proponderance of sentiment, is strongly on their side. For, even admitting that there may be a few species which do more harm than good, yet with regard to birds in general, it is almost universally believed that their existence is essential to the welfare of mankind, and indeed to the harmony of nature, by preserving the balance between the tribes of insects and the vegetable kingdom. It is true that most of them, whilst active in ridding us of our insect foes, require that we should contribute something to their support, and sometimes draw pretty heavily upon us; but the species whose name is inscribed at the head of this article, furnishes an example of an humble friend who never obtrudes himself upon our notice, and who, whilst rendering us incalculable benefit, demands from us nothing in return.

Most persons who have traveled over our Western prairies must have had their attention called to a little brownish colored bird, often seen dusting himself in the road, and who has run or flitted into the neighboring grass as the traveler approached. This is the *Alanda alpestris,* or Prairie Lark, sometimes called—but much less appropriately—the Shore Lark. It belongs to the same genus as the famous Sky Lark of Europe (*Alanda arvensis,* Linn.) We must take care that similarity of names does not lead us to confound this species with the equally common Meadow Lark, which is a much larger and more conspicuous bird, with a gray striped back and a bright yellow breast, and which strictly is not a lark, but belongs to the family of starlings. The Prairie Lark is of about the same size as some of the larger kinds of sparrow, though somewhat more slender in shape. The predominant color is a brownish-gray, more strongly tinted with reddish about the neck and shoulders. The color beneath is sordid white, tinted with brown on the breast and sides. There is a broad, black band across the middle of the forehead, terminating laterally above and behind the eye in a little pointed tuft of feathers, which the bird has the power of elevating and depressing at will, so as to resemble little horns. The female is more obscure in her markings, and the little horn-like appendages are wanting. These birds remain with us nearly all the year, and may be seen, even in winter, gleaning a scanty subsistence upon the bare patches of prairie from which the snow has blown off. But the peculiarity of this bird, which has led us to introduce its history as appropriate to this work, is the instinct with which it discovers and destroys those grubs which infest corn fields, and which often do so much damage to this and some other crops. It came to my knowledge through the observation of an intelligent and observing farmer in my neighborhood, upon whose accuracy entire dependence can be placed.

Whilst going through with the first hoeing of his corn, he observed, running about amongst the hills, little grayish birds, which from his description, and from the absence of any similar bird with which it could be easily confounded, I have no doubt was the present species. Upon observing one of them more attentively, he became interested in watching its operations. Running along near the hills, it stopped abruptly from time to time opposite a hill, and stood still as if listening; then, having apparently determined its direction, it inserted its bill at a short distance from a spear of corn, and by a rapid, rotary motion, partially buried itself in the loose earth, and then jerking backwards, dragged out a large grub, which, from its situation, may be reasonably supposed to be one of those larvæ, of which there are several different kinds, known by the name of cut-worms. Taking this worm in its bill it ran along, until by its acute sense of hearing, or by some other instinct, it became aware of the presence of another of its insect prey. Then, laying down the one previously obtained, it quickly dislodged another in the same manner, and seizing them both in its bill again pursued the search. Having obtained as many as it could carry, it flew off to the neighboring grass-field, having in all probability a brood of young awaiting its arrival. Not unfrequently one of these small birds would carry off four or five grubs at once, often having to lay them down and take them up several times before it could get secure hold of them all.

When we consider how common these birds are, it is easy to conceive that they must destroy an immense number of larvæ in the course of the season.

Whilst writing this article, I have obtained several specimens of this kind of bird, both male and female, for the purpose of identifying the species with certainty. Upon examining the contents of the stomach I found in most of them several grains resembling hulled oats, and in one of them was a larva nearly one inch in length, of a pale green color, with a brown head and tapering a little at each end, being different from the cut-worm, but resembling, and perhaps identical with, the spindle-worm, so-called, which burrows into the stem of the corn plant. It would be a curious fact if it should prove that this bird possesses the instinct to detect and destroy two noxious larvæ, so different in appearance and habits as those here mentioned.

Thus does this shy and unobtrusive little bird perform its humble but useful part in the economy of Nature, and, whilst seeking a subsistence for itself and young, unconsciously renders an important service to the husbandman.

A STATE ENTOMOLOGIST FOR WISCONSIN.—"The suggestion I have just made may be viewed differently by different members of this Society, but the suggestion I have now to make will, I know, meet with your general approbation. We have long felt the need of a State Entomologist. As horticulturists we see and feel the importance and absolute need of such an officer—more so than does any other part of the community. Some of the older States—and, indeed, some of the younger States—have made such appointments. And I trust the time will soon come when our own State will follow their wise example. We are an agricultural people, and as such are afflicted with almost every plant-destroying insect on this side of the continent. And while other countries and States are seeking, with success, for means to diminish or avert the ravages of such plagues, we should not be folding our hands awaiting for something to turn up, but be following the example of our more intelligent neighbors. Therefore, I suggest that before you separate you elect, as Entomologist to the State Horticultural Society, Professor Daniells, of the Wisconsin State University. I venture to make this recommendation simply because the Professor is the best man I know of for the place, and because I know that he will spare no pains to serve the Society and the people."—*From President Hobbins's Address, delivered at the meeting of the Wisconsin State Horticultural Society, at Madison, Feb. 1st*, 1870.

HINDRANCES TO SUCCESSFUL FRUIT-GROWING.

[From an Address delivered at the Fourth Annual Meeting of the Centralia (Ills.) Fruit-Growers' Association, by B. PULLEN, the retiring President.]

We are frequently asked, "have we a fruit country?" meaning, of course, our own immediate section. Our answer would be YES, preeminently so. How are we to satisfy any one who would ask such a question, with all the facts before him, that our answer is correct? He speaks knowingly of other sections, of immense and successive crops, great profits, &c. This is our El Dorado—just what we are looking after. We take occasion to inform ourselves, and what do we find? why, the old story, that "distance lends enchantment to the view," and so we return again into our own holes, "wiser if not better men." We might furnish statistics showing the relative value of this as compared with other well-known, longer-established fruit districts, and suffer none by the comparison. We know, of our own knowledge, that in the twelve past years but one entire failure has occurred. This was the summer following the winter of 1864 and 1865. We were disposed to call that an entire failure, and yet the finest and most profitable crop of strawberries we have ever seen was raised here in the summer of 1865. Do we pronounce an agricultural district a failure because bountiful crops are not every year raised, or because of the entire or partial failure of every one of the cereal crops grown there? Of course not. If we did, we should pronounce against one after another until we should have none left. Is it just to pronounce against a fruit region for the same reason? Where, then, is the trouble? There must be a cause for so much complaint and disappointment. Is it not possible that we ourselves have proved failures? We only want to let ourselves down as easy as possible by blaming the country. I make the assertion, without fear of successful contradiction, that there is not one really successful Horticulturist in our Centralia fruit district, and for no other reason than that we ourselves are failures. This is not so much the result of ignorance as it is a criminal neglect on our part to make an energetic use of the knowledge we already possess. The damage to the fruit-grower yearly by the depredations of the Curculio and Codling-moth are almost incalculable, sweeping away at times entire crops; and yet how many run a Curculio-catcher, pick up the fallen fruit, keep swine in their orchards, bandage their trees with a hay-band to afford a shelter and hiding place for the larvæ of the Codling-moth to undergo her transformations in, and thus be entrapped; or scrape the body of their trees, dislodging and destroying all insect life there concealed? All these are well known, simple and efficacious remedies, at least to the extent of securing a good crop under ordinary circumstances. I suppose there is not a single person in our community who practices all or even one of these simple remedies thoroughly. I know of none such, but I know of numbers who are ready to assert upon all occasions that fruit here is a failure. They seem to ignore the fact that the presence of these pests in such profusion only gives the lie to their assertion. Insects and fruit go together; they are one and inseparable. * * * * * I would, therefore, earnestly recommend to every member of this Association, and to every fruit-grower, that we combinedly operate together in making war upon them, using all the knowledge and means in our possession to keep them in subjection. The bodies of our apple trees should be carefully scraped, and the larvæ of the Codling-moth hunted out and destroyed. The fruit room, and all apple barrels and bins should undergo a similar process, before the moths make their appearance in the spring. The latter hiding places are thought by many to be the most prolific source of our annual supply of this insect, and should by no means be overlooked.

The Curculio should come in for a large share of our attention. We should be prepared to run the Curculio-catcher with a vengeance, and take advantage of the information conveyed to us by our State Horticulturist (Dr. Hull), that the Little Turks gather upon the trees ten or twelve days in advance of their depositing any eggs in the fruit, for the purpose of pairing off, and that if caught during this period, we not only get rid of the supply on hand, but of the generation which follows, which would not be the case if not caught until later in the season.

I would also recommend the appointment of an active committee, whose duty it shall be to visit all the orchards possible in our vicinity monthly, to note the management of each, and convey to this society the results of their observations. Much useful information might thus be obtained by the committee, and through them be conveyed to the Society for the general good. * * * * * * * *

You will perceive, gentlemen, that not much of the fanciful has occupied our thought in what has been said. We propose to leave this to those who choose not to dabble in the more practical part of our profession. Indeed, our mind has been so often toasted and feasted with the beautiful imagery in connection with our subject, that when called upon to face some of the unpleasant practical realities, we have felt as if an emetic had been administered and that we were prepared to disgorge at once and forever all that is not real. We must acknowledge, however, that we do sometimes find ourselves indulging in this weakness of feeding our fancy. Nothing occurs to us at this moment as being more likely to ensnare and captivate the senses than in contemplating some of the pleasures to be derived from a pursuit so God-given, transporting us into the very garden of our first parents. Like them we find there is the bitter with the sweet—the forbidden fruit—for we pluck the king of fruits—the Apple—and what do we find but the larvæ of the Codling-moth? which has anticipated us and sipped, as it were, the very nectar from our lips. We turn from it in disgust to the queen of fruits—the Peach, and again what do we find? Why, gentlemen, the wriggling, loathsome progeny of the everlasting "nigger in the wood pile"—the Little Turk, and thus we are driven from the garden into the cold world to fight single-handed with our adversary, and when there, we are forced to exclaim, "that all is not gold that glitters."

THE WORM EXTERMINATOR.

The Entomologist is giving the venders of patent insect exterminators some home-thrusts, in the way of showing up the imposition practiced. It is passing strange that people will submit to be humbugged by strangers of whom they know nothing. But it is true that people will patronize every itinerant vender of nostrums who may perambulate through the rural districts of any State in the Union. We have before us a number of circulars received from parties who offer a fruit-tree invigorator and insect-destroyer, price five dollars for the right to use said nostrum.

This circular claims that scientific and practical cultivators have used and endorse the said invigorator, all of which we believe to be untrue.

We happen to know that several eminent florists and fruit-growers live in the immediate neighborhood of the man who offers this humbug mixture, but their names do not appear in the circular—and why not? Simply because these men are experienced horticulturists, and cannot be caught with such chaff.

Our advice is, never patronize a stranger unless you know the value of the article offered for sale.—*Hearth and Home.*

SCIENTIFIC LANGUAGE.

BY W. V. ANDREWS, NEW YORK.

Ordinarily, if we seek to convey information on any important subject, we make our language as plain and clear as our ability permits us. In treating of scientific subjects some authors seem to reverse this common-sense rule, and to conceive that the harder and more unusual the words are in which they clothe their ideas, the more fitting and appropriate they are for the purpose of instruction. This, at all events, is the most charitable construction we can put upon their conduct, for surely it is not the avowed object of the instructor to puzzle and bewilder his pupils. These remarks, although applicable to the language of scientific treatises in general, are especially so to those written on the "Natural Sciences," and particularly to those on Botany and Entomology. With the former I do not propose to deal at present.

Dr. Knaggs tells us that *"pursuit of truth, with a love of nature, and a laudable desire to investigate the histories of the wonderful organisms which God has, in his wisdom, created,"* are among the motives that induce men to become entomologists. Such being the case, it certainly is to be regretted that the enthusiasm of the young student should be at all repressed by the unfortunate fact that his instructions are couched in a language which, as Horne Tooke observed of Dr. Johnson's Dictionary, is as much the language of Hottentots as of Englishmen.

It is of importance to remember that this is by no means exclusively the complaint of the amateur entomologist. Years ago, Jas. Rennie denounced the scientific jargon of professed entomologists in this wise:

"In describing species, either well known, or 'new to our *'Fauna'* or our *'Flora,'* the current style, misnamed scientific, may be fairly characterized as a uniform tissue of pedantic barbarisms, devised, it would appear, not for the diffusion, but for the concealment of knowledge. If the descriptions affect to be in English, the language employed is assuredly not English. Thus we have 'flavous' and 'luteous' for 'yellow,' 'griseous' for 'grey,' 'fuscous' for dusky; while similar words are not only compounded with Latin derivatives, as *'ochraceous-fuscous,'* meaning, I conjecture, dusky buff, but with plain English, such as 'testaceous-red,' 'hoary-griseous,' 'griseous-rosy," 'rusty-testaceous,' and numerous others equally offensive to good taste."

I need quote no further from this author, because our every-day reading affords us instances of what I can not but consider useless displays of possible erudition. I say useless, because it is evident that the assertion that it is necessary to use terms derived from the "learned languages" in teaching a science which is sometimes studied by persons not acquainted with the English language, will not bear a moment's investigation.

In a work devoted to entomology I find the following sentence: "Head and thorax, above, *obscure brown* mixed with *ashen* scales. Abdomen, *obscure testaceous-cinereous.*" By reference to a Latin dictionary we find that "testaceous" may mean "brick-colored," and "cinereous" "ashen-grey." So *"obscure testaceous-cinereous"* means a color which is an *"obscure brick-colored ashen-grey;"* and anybody who is sufficiently versed in the English language to understand the phrase, "Head and thorax obscure-brown," would probably understand "obscure brick-colored ashen-grey" just as readily as he would comprehend *"obscure testaceous-cinereous,"* the probability being that he would understand neither. The newspapers have been laughing at some contemporary for describing an oyster as a "marine acephalous mollusc of the lamellibranchiate order of the genus ostrea;" but is there anything in this more absurd than is to be found in many a text book on entomology?

With reference to mere *names,* I have little objection to the use of "learned terms," for here there is some necessity for their use. I should have less objection if the terms selected conveyed any idea of generic or specific difference, or gave any notion of the nature or appearance of the thing thus named. For instance, no one can avoid seeing that the word *ligustri* is properly applied to a moth, the larva of which feeds on the privet, and *crategei* to one feeding on the black thorn.

But it is notorious that names are not always thus judiciously bestowed, indeed very rarely so; and a recent English author, writing a book for the use of the young entomologist, thinks it necessary to give the following advice.

After stating that it is necessary for the student to know the Latin names of insects, because they are current in all European languages, he says: "Another piece of advice is, don't *waste* time in trying to puzzle out the *meaning*—the why or the wherefore—of the butterflies' names. Now and then, certainly, they have some allusion to the insect's appearance, or to the plant on which it feeds; thus, for instance, *Gonepteryx rhamni,* the entomological name of the Brimstone Butterfly, means Angle-winged (butterfly) of the Buckthorn, and this is very appropriate and descriptive; but in general there is no more connection between the name and character of a butterfly than there is between a ship's name—the *Furious*, the *Coquette*, or the *Betsy-Jane*—and the moral disposition or appearance of the vessel that bears it."

This, of course, is to be regretted; but so far as names already bestowed are concerned, the evil is irremediable. But may we not ask that those entomologists who devote their energies mainly to the description of genera and species should, in the future, take some little trouble to seek out names which convey an accurate idea of that which they wish to describe? and always *accompany it by a translation*, so as to prevent any possibility of misconstruction of their meaning. There is another point of great importance. In forming a new species or genus, why not always give the distinctive differences that distinguish the new species or genus from its nearest congener or family? Rennie, in his valuable synopsis of British LEPIDOPTERA, says:

ACHERONTIA—Wings entire and acute, the jaws short.

SPHINX—Wings entire and acute, jaws longish, and the antennæ not clubbed at the tip.

The inference here *may be* that *Sphinx* is distinguished from *Acherontia* by its longer jaws, and by not having the antennæ clubbed at the tip. But we are not told which sort of antennæ Acherontia has, and the learner would certainly hesitate before drawing the above inference. Why not say—"Differs from Acherontia in such and such particulars?" What makes the matter worse, in this case, is the unfortunate use of the word "club," because the author has just told us that one of the distinguishing marks betwixt a Butterfly and a Moth is that the former has clubbed-tip antennæ and the latter has not.

While, however, making these complaints, we should remember that the fault does not entirely lie with the *Clerks* of the science. Lying under great obligations to them, we have perhaps attached too much importance to their labors, while we have underrated the efforts of the "mere collector." A little literary vanity may be excused under such circumstances; and the show of possible erudition, which consists in the use of words not comprehensible by the illiterate, may at one time have been harmless enough; but now, when a continuance in such a course acts as a bar to the advancement of the science, it is time to protest against that continuance, and to insist that the language of the science shall be the language of every day life, so far as it is available.

"The individual," says Dr. Knaggs, "who sits in his library all the year round, up to his eyes in entomological dry specimens, and drier literature, writing elaborate Latin diagnoses of probable new species, or turning out descriptions of improbable ones, at the rate of so many per hour, is apt to imagine that *his* occupation constitutes Entomology; and, as a consequence, he too often looks down upon the poor fly-catcher with something like contempt; but for all that, the despised collector often, of the two, does the more for science, by which is here meant the acquisition and diffusion of sound knowledge, and not the art of piling up a synonymy for the bewilderment of future generations. The observer, on the other hand, when his observations are conducted with caution and carefully recorded, is the most scientific; or in other words does more than the other two put together to acquire and diffuse knowledge."

As I have already said, I have no doubt that the superciliousness of the literary Entomologist may have some effect upon his language; but if he will remember that "science must be catholic to be worthy of the name," doubtless he will, henceforth, seek to obtain that catholicity by writing in as plain English as he finds himself possessed of.

TOMATO FRUIT-WORM.—We learn from a recent number of *Scientific Opinion*, that at a late meeting of the London Entomological Society, Mr. Jenner Weir exhibited specimens of our Cotton Boll-worm Moth (*Heliothis armigera*, Hübn.), which were bred from larvæ which fed on the fruit of the Tomato. As we have already shown (AMERICAN ENTOMOLOGIST I, pp. 212-213), this same species attacks our corn, and does great damage to our tomatoes by eating into the fruit; and the fact of its being bred from the Tomato in England, where this fruit is with difficulty grown, is interesting and suggestive. This same worm, as set forth in the second number of our second volume, is now known to feed also on green peas and on the stems of the Gladiolus.

ATTACKS OF INSECTS AFFECTED BY COLOR.—Darwin (*Animals and Plants*, ii. 277) states that "it is certain that insects regulate in many cases the range and even the existence of the higher animals, whilst living under their natural conditions. Under domestication light-colored animals suffer most; in Thuringia the inhabitants do not like grey, white, or pale cattle, because they are much more troubled by various kinds of flies than the brown, red or black cattle. An Albino negro, it has been remarked, was particularly sensitive to the bites of insects. In the West Indies it is said that 'the only horned cattle fit for work are those which have a good deal of black in them. The white are terribly tormented by the insects; and they are weak and sluggish in proportion to the black.'"

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 7.

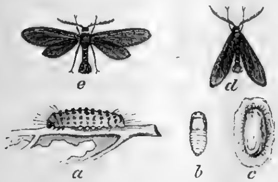
The American Procris.

(*Procris* [*Acoloithus*] *Americana.*)*

[From the Second Missouri Entomological Report.]

During the months of July and August, the leaves of the Grape-vine may often be found denuded of their softer parts, with nothing but

[Fig. 107.]



Colors—(*a*) black and yellow; (*b*) honey-yellow; (*c*) whitish; (*d* and *e*) black and orange.

the veins, and sometimes only a few of the larger ribs left skeleton-like, to tell of the mischief that has been done. Very frequently, only portions of the leaf will be thus denuded, and in that event, if we examine such a leaf closely, we shall find the authors of the mischief drawn up in line upon the yet leafy tissue, with their heads all toward the margin, cutting away with their little jaws and retreating as they feed.

[Fig. 108.]

Colors—Black and yellow.

These little soldier-like files are formed by worms in black and yellow uniforms which produce a moth popularly known as the American Procris. The eggs from which they hatch, are laid in small clusters on the underside of the leaves, and while the worms are small, they leave untouched the most delicate veins of the leaf, which then presents a fine net-work appearance, as shown at the right of Figure 108; but when they become older and stronger they devour all but the larger ribs, as at the left of the figure.

When full grown* these worms disperse over the vines or forsake them entirely, and each spins for itself a small, tough, whitish, flattened cocoon (Fig. 107, *c*), within which, in about three days, it changes to a chrysalis (Fig. 107, *b*), 0.30 inch long, broad, flattened and of a light shiny yellowish-brown color. In about ten days afterwards the moths (Fig. 107, *d* and *e*) begin to issue. This little moth is the American representative of the European *Procris vitis;* it is wholly of a black color, except the collar, which is of a deep orange, and the body ends in a broad fan-like, notched tuft, especially in the male. The wings are of a delicate texture, reminding one of crape, and when the insect is at rest they generally form a perfect cross with the body, the hind wings being completely hidden by the front ones, which are stretched out straight at right angles, as in the genus *Pterophorus,* to which belongs the Grape-vine Plume. We have, however, on one or two occasions found the American Procris resting in the manner shown at Figure 107, *d.*

This is the only North American Grape-vine feeding caterpillar which has a gregarious habit, and as gregarious insects are always more easily subdued than those of a solitary nature, the American Procris need never become very destructive. Its natural food is undoubtedly the wild grape-vines of our forests, and the Virginia Creeper, and Mr. J. M. Jordon, of St. Louis, has noticed that while it very commonly attacks the foliage of the Concord, yet it never touches the Clinton and Taylor in his vineyard—a taste which is remarkable and not easily accounted for, since the foliage of the latter kinds is more tender and generally more subject to insect depredations than that of the former.

There are two broods of this insect each year with us, some of the moths from the second brood of worms issuing in the fall, but the greater part not leaving their cocoons till the

*This is the *Aglaope americana* of Clemens, *Procris americana* of Boisduval and Harris, and *Ctenucha americana* of Walker.

*The full grown larva (Fig. 107, *a*) measures rather more than half an inch, and tapers a little towards each end. It is of a sulphur-yellow color, with a transverse row of six velvety-black, prickly tufts on each of the principal segments, the lower tufts being less distinct than those on the back. The first segment is entirely black with a yellow edge, while the spots on segments 11 and 12 usually run into one another. Head small, brown, and retractile, being usually hidden in the first segment. Fine scattering hairs anteriorly, laterally and posteriorly. The young worm is of a very pale yellow, covered with numerous fine white hairs, with a slight grayish-brown tint on the head, and with the fifth and seventh segments paler than the rest, and having the black spots scarcely visible.

following summer. During the month of June they may be seen in pairs about the vines, and we have also frequently observed around Hermann, a very closely allied but smaller and different moth (*Alcoloithus falsarius*, Clem.) about the same season of the year. This last, though so closely resembling the other, may be distinguished by being scarcely more than half as large; by the body lacking the anal tuft and being comparatively much thicker and shorter; by the hind wings being comparatively larger; and by the collar being of a paler orange and divided on the top by a black point.

The American Procris, though the fact is not mentioned by other authors, is subject to the attack of at least one parasite, with us; for we have bred from it a very peculiar little four-winged black fly belonging to the great *Chalcis* family, and which Mr. Cresson, of Philadelphia, refers doubtingly to *Perilampus platygaster*, Say.

THE DEATH WEB OF YOUNG TROUT.

An Enemy to Young Trout.—The Pisciculturist, Seth Green, is known throughout the land for his energy and perseverance in inquiring into and ascertaining the cause of anything that may be new in his little world of interest or nature. For many years Mr. Green has been at a loss to account for the enormous destruction of very small trout, but he has now ascertained the cause, and gives to the public, for the public good, his discovery. He says in regard to the matter:

"There is a small worm which is the favorite food of trout and many other kinds of fish. This worm is one of the greatest enemies which the small fry have. It spins a web in the water to catch young fish, just as a spider does on land to catch flies. I have seen them make the web and catch the fish. The web is as perfect as that of the spider, and as much mechanical ingenuity is displayed in its construction. It is made as quickly and in the same way as a spider's, by fastening the threads at different points and going back and forth until the web is finished. The threads are not strong enough to hold the young trout after the umbilical sac is absorbed, but the web will stick to the fins, get around the head and gills, and soon kills the fish. I have often seen it on the young trout, and it has been a great mystery and caused me many hours, days and weeks of study to find out what was wound around the head and fins of my young trout and killed them. I did not find out until lately while watching recently hatched whitefish. These are much smaller than the trout when they begin to swim, and they are caught and held by the web. I found ten small whitefish caught in one web in one night. This web was spun in a little whitefish preserve, into which I had put one hundred young fish. The threads spun by this worm seem to be much finer than the common spider's web, and they are not visible in the water until the sediment collects upon them. They can then be seen very plainly. These webs cannot be spun where there is much current, and can be easily seen in still water by a close observer"

Probably hundreds of our readers have noticed this web in the water, but have never stopped to inquire into the matter, or whether it was a worm or a spider that inhabited the submerged nest and made it. It has remained for Mr. Green to solve this mystery of the water.

The above item appeared originally in *Wilkes' Spirit of the Times*, and has been quite extensively copied. The mystery is, however, not yet solved, and we shall be glad, by the aid of such of our correspondents who know anything about it, to give an illustrated account of this mysterious worm. We have heard from Mr. Green, who promises to send us specimens. He informs us that "the word web hardly describes the threads, which are not at all symmetrical like the web of a spider, but in most instances an irregular mass of nearly parallel threads." We learn from Mr. Fred. Mather, of Honeoye Falls, Monroe county, N. Y., who is an extensive trout-breeder, that he has seen a web in his hatching troughs, and that it often forms on the eggs strong enough to lift several in a mass; but that he always supposed it to be "a vegetable growth or a product of the water, like *Byssus*." Mr. E. Sterling, of Cleveland, Ohio, has also noticed the same web, and has been at a loss to account for it.

All we can at present say is, that no explanation of the fact is yet on record, other than that given by Mr. Green. The worm is in all probability the larva of some species of Caddice-fly (Phryganeidæ), for we know of no other true insects that spin a web in the water. These Caddice-fly larvæ are case-bearers, but it was long ago ascertained by Willoughby and afterwards by Pictet, that many of them reside in immovable cases attached to stones, etc., and that they are consequently compelled to quit their cases and search for food in a naked state.* This may account for the fact that these cases were not observed by Mr. Green, who informs us that "by taking up one of the worms on a twig and letting the former drop into the water, a fine thread will be found attached to the latter." Let us hear from our piscicultural subscribers, and living specimens of the worm will also be most thankfully received. We always take delight in solving mysteries.

* Westwood, *Introduction*, II, p. 67.

IOWA BUTTERFLIES.

The following species, collected in Grinnell, except as otherwise stated, are to be added to the Preliminary List of Iowa species reported by Mr. Samuel H. Scudder in Vol. I, Part 2, of the Transactions of the Chicago Academy of Sciences. Grinnell is on high rolling prairie, the summit level between the Mississippi and Des Moines Rivers, by the Rock Island and Pacific Railroad:

Papilio Turnus, Linn.—Yellow variety. Common.

Papilio Asterias, Fabr.—Common.

Papilio Philenor, Fabr.—Grinnell and Keokuk. Differs from Boisduval's description in primaries not greenish; tail not whitish at base. Differs from Say's in first thigh having a conspicuous yellow line; crenæ yellowish-white. Two specimens—that from Grinnell expands near 4 inches.

Papilio Thoas, Linn.—Keokuk and Davenport.

Papilio Ajax, var. *Marcellus*, Cram.—Keokuk and Davenport.

Argynnis Myrina, Cram.—Add to Boisduval's description—underside of primaries with three dull whitish spaces, two of which flank the middle nacre, and are each divided by a transverse brown line. Antennæ not conspicuously annulated with white. Expands 2.3.

Argynnis Bellona, Godt.—Not uncommon. Amplify Boisduval's description—summit of primaries with ferruginous patch, and before it a pale yellow oblique band. Four of five specimens expand nearly 2 inches; the other 1.75.

Vanessa Antiopa, Linn.—Not rare.

Vanessa Progne, Cram.—Rare so far as observed. Expands 2.5.

Erebia Nephele, Kirby.—Not uncommon. Very dark brown. Expands 2 inches.

Hesperia Bathyllus, Sm. Abb. (*Pylades*, Scudd.) —One specimen.

Nisoniades Catullus. Godt.—Add to Abbott's description—head spotted with white above. Front of palpi and neck, white. No spots on secondaries. Expands a little more than 1 inch.

Thecla Strigosa, Harr.

The following species, reported by Mr. Scudder, I have collected at Grinnell:

Glaucus, Protodice, Philodice, Eurytheme, Coesonia, Comyntas, Syrichtus, Erippus, Misippus, Ursula, Idalia, Aphrodite, Nycteis, Tharos, Atalanta, Cardui, Huntera, Interrogationis, Portlandia, Alope, Boisduvalii, Tityrus, Bathyllus, Martialis, Ahaton, Hobomok, Aphrodite, J-album, Also, a *Coenia* from Keokuk, where it is said to have been common a few years since, but not noticed of late.

H. W. Parker.

Iowa College. March, 1870.

[Note by the Editor.—We regret that our correspondent has not mentioned the sex of *Papilio philenor*, for in the female the primaries are scarcely ever greenish; and the Iowa specimens cannot differ from Boisduval's description in the tail not being whitish at base, because Boisduval mentions no such character in the original French (*Lepidopteres diurnes*). No doubt Mr. Parker has been led into error by the English rendering in Morris's *Synopsis*. It is always dangerous to quote second-hand from an author.]

SOUTHERN NOTES.

BY J. PARISH STELLE, OF TENNESSEE.

An Experiment for Tobacco-Growers.—I visited the plantation of a Mr. George Harris, in West Tennessee, last summer, and found him protecting his crop of tobacco from the ravages of the Tobacco Worm (*Sphinx 5-maculata*, Haw.) in a most novel kind of way. A border some six or eight feet wide, and running entirely around his tobacco-patch, was thickly grown with Jimpson or Jamestown weed (*Datura stramonium*, Linn.), the seed having been sown, I suppose, for I neglected to ask. At the time of my visit the weeds were in full bloom, and on every third day Mr. Harris, so he told me, went among them and dropped a little arsenic into the bell of each flower. The hawk moths came at night to deposit their eggs upon the tobacco plants, but when they reached the border they could not think of crossing without first having a dip into their favorite flowers; and, as a consequence—to use Mr. Harris's own expression—"two minutes later found them laid out to dry." He assured me that on some mornings hundreds of dead moths were to be found lying about the edges of his patch, and that the appearance of a worm on any of his plants was considered a rare thing, indeed.

I was only a short time on Mr. Harris's plantation, therefore I cannot, of course, stand good for all he claimed as the result of his experiment; still, I will say, without hesitation, that I saw nothing which led me to form a single doubt. His tobacco was clear of worms, and I saw him putting arsenic on his Jimpson flowers. I also saw a number of dead moths, and a knowledge of the fact that they fly near the ground, and slowly from plant to plant, on their way to deposit their eggs, caused me to believe that they were killed as he claimed, and that few would be likely to cross his border without sharing the same fate. It would cost but little to try the thing, at all events, and therefore I think our tobacco-growers would do well to give it a fair test. If it will protect tobacco it will also protect tomatoes; and I am inclined to think that fly-cobalt would be a more effectual poison to use than arsenic.

Toads in the Garden.—I wish to say, by way of postscript to the article on page 91, Vol. II, of this magazine, entitled "Toads vs. Bugs," that I kept about a dozen toads in my garden all through the last summer, and found them to be zealous insect exterminators. The only objection I made to them grew out of the fact that they took no pains to discriminate between my friends and my foes; all insects excepting one or two, perhaps, went the same way with them. They had no taste for the Striped Potato Beetle (*Lytta vittata*, Fabr.); and, although I saw them "bolt" an occasional Squash Bug (*Coreus tristis*, DeGeer), it didn't seem to go down with anything of a relish. They will feed on squash bugs, however, as I know from having had some vines entirely cleared by them early in the season; but I think they only do so in cases where other insects are extremely scarce. I could note no loss to my fall brood of squash bugs, attributable to their being in the garden.

Contrary to the general supposition, there is but little of the Gipsey spirit about the toad, for having chosen his beat, he seldom goes beyond it, or changes his location during the summer. One may settle him for the season at almost any particular locality by simply penning him up in a temporary enclosure for a few days, and then removing the enclosure without disturbing him. I have often established them in different parts of my garden on this plan, and but seldom failed to find them in the neighborhood of their respective stations every evening.

A toad brought into a garden and immediately set at liberty, will usually strike for some other parts the first night; but a few days' penning up seem to attach him to the locality.

A Word to Southern Culturists.—I wish to see all my planter friends in the South take the American Entomologist, for I know that it would bring them a large return for a small outlay. The publication is a national one, and yet it is sectional enough so far as we are concerned, for it is fairly beginning to transpire that the natural sectional-lines of the country run north and south instead of east and west, and that the general interests from extreme to extreme are so closely identified that no portion could get along well without the others.

Our section, the best agriculture section in the association, if not the best on the continent, stretches from the Gulf of Mexico to and even above the Great Lakes, and the American Entomologist, devoted alike to the interests of every part of it, is published at a site as nearly central as well could be. The Entomologist is, therefore, the proper periodical to encourage, since reason cannot do otherwise than show that a work of such character would be of far more value to us than it could possibly be if strictly local.

This thing of being extremely southern or extremely northern—trying to create two distinct interests, when but one legitimately exists; or, in other words, striving to lead those who live by an exchange of products to believe that they are a distinct people—is not only foolish to the last degree, but extremely injurious to all. Such reflections, and nothing else, deterred me from undertaking the publication of a "Southern Entomologist" four months ago. I saw that the American Entomologist was all that the Southern people could desire, and so gave up the idea in the belief that they would patronize it, and thus derive greater benefits than they could from a publication purely local.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

Is the New York Weevil the Cause of Pear Blight?—*Chicago, Ills., March 31st*, 1870. —A gentleman of this city, formerly residing at Lake Forest, a suburb of Chicago, communicated to me a few days since, some facts he has observed in regard to the "pear tree blight," from which he has formed the theory that the blight is caused solely by the New York Weevil (*Ithycerus noveboracensis*, Forster). His observations extended over some five years, and were briefly as follows:—He never observed any appearance of the blight till after the appearance of the beetle, which, in four out of five years, occurred on the same day—June 19th, and in the fifth year on June 20th. That in addition to the depredations described in the American Entomologist for July, 1869, the insect deposits on the bark of the twig or branch, a liquid substance (whether excrement or saliva, he was uncertain, but supposed it to be the latter), which extended some inches in length by an eighth of an inch in width. That this liquid soon turned black, and seemed to penetrate to the heart of the branch, turning the wood also black. If the branch was of considerable size the tree would die; if quite small the poison would remain latent till the next spring, but in the end would certainly kill the tree. That by cutting away the deposit before it turned black no blight followed. That by stationing men to watch for and destroy the beetles as soon as they appeared, he saved his trees while those of his neighbors were affected. He has given me a specimen of the insect which he is certain caused him the loss of a tree in the manner described. I take the liberty of communicating these statements to you, because I am unable to form an opinion as to the correctness of his theory, and because if there be any probability of its correctness, it may be worth while to investigate farther. Should be pleased to hear from you in regard to it.

H. H. BABCOCK.

[We have ourselves never observed this peculiarity in the New York Weevil, but do not doubt the correctness of the foregoing observations. We have serious doubts, however, as to this beetle being the cause of the real Pear Blight, which is considered, by the most eminent horticulturists of the land (and we agree with them), to be of fungoid rather than insect origin. The work described by our correspondent very probably produces a sort of blight, and several bark-boring and wood-boring beetles are known to produce a similar effect. But this insect-blight must not be confounded with the far more subtle and destructive Pear-Blight so called; and the singular assertion of Dr. Packard, that "the various species of *Scolytus*, *Tomicus*, and *Xyloterus* give rise to the disease called fire-blight,"* is, to say the least, very loose and indefinite, and calculated to mislead. We hope to find time before long, to illustrate the differences between these different kinds of blight, but meanwhile, shall gladly publish more detailed statements from the gentleman from Lake Forest.—ED.]

THE URSULA BUTTERFLY MORE COMMON THAN DISIPPUS IN SOME SECTIONS OF THE COUNTRY—*Newport, R. I.*—I was showing Mr. Scudder a suite of Newport butterflies, and was asking him what the Darwinian theory could make of the close resemblance between the butterflies *D. archippus* and *Nymphalis disippus*, while the larvæ are so utterly unlike, when he gave me your paper on "Imitative Butterflies." Let me express to you the pleasure with which I have read it. It is so very ingenious and suggestive, whether true or not; and every one who, like myself, is inclined to the Darwinian theory, must be quite disposed to believe it. The only statement from which I shall dissent is that the *Ursula* Butterfly "is everywhere quite rare," at least, as compared with the other species. I have no doubt that this is generally true, but since removing here from Massachusetts, I have been struck with the fact that it is quite otherwise here. I am very sure that in Newport it is one of the commonest of the larger butterflies, and decidedly more so than the *Disippus*. I will observe specially next summer, but am sure of the fact. Mr. Scudder also spoke of its abundance on Cape Cod. This may, however, be due to special causes, which, if known, would only further illustrate your theory—*e. g.*, the absence of certain birds which attack the *Ursula* and spare the others. I do not know which birds do this; but our common fauna differs in some respects from that of Massachusetts.

THOMAS WENTWORTH HIGGINSON.

BLADDER PLUMS—*Alton, Ills.*—I see in No. 4 of the ENTOMOLOGIST, an article on "Bladder Plums," and a statement of Dr. Hull's, saying that they are unknown in this locality. I found them here on the wild Plum (a blue variety) two years ago. The tree on which these abnormal plums grew had probably two or three hundred of them on it, all affected about alike. I was particularly struck with this appearance of the fruit, as it was new to me. I broke open several of them, and found them, as you say, hollow, and much larger than they would have been if healthy and natural; but these of mine had insects in them, which much resembled in appearance woolly lice, being of a downy appearance, and of a bluish-white color. These lice adhered to the interior wall of the phantom plum, and the plums and insects resembled galls more than anything else. I noticed them very particularly, because they were something new. I have never seen their like since, and mayhap never shall.

GEO. W. COPLEY.

CORN KERNELS IN COCOONS OF CECROPIA MOTH—*Geneva, Ills., Feb. 22d*, 1870.—In looking over the AMERICAN ENTOMOLOGIST, I see the curious fact stated (page 100) of a kernel of corn being found in the cocoon of a Cecropia Moth. I have seen the same thing in two instances in cocoons brought to me for examination by a young gentleman of this place. These repeated instances show that the corn could not have been dropped there by some bird accidentally, as you conjecture The only plausible explanation I can give, is that the corn is deposited there for safe keeping during the formation of the cocoon (or possibly forced into the loose end of it after completion) by some bird. And this bird, I have a strong suspicion, is the Blue Jay, which is well known to have the habit (like other *Corvidæ*) of pilfering and hiding in holes and crevices, any small objects which attract its notice.

WM. LEBARON.

THE HARLEQUIN CABBAGE BUG—*Austin, Tex., Feb. 28th*, 1870.—Within the past few days we have gathered by hand over 47,000 (forty-seven thousand) of these bugs. This is a great bug country, and I have my share of them in growing vegetables for market, and find your journal very useful in enabling me to tell my friends from my enemies. BENJ. R. TOWNSEND.

* *Guide*, etc., p. 492.

INSECT DESTROYER—*New York, Feb.* 14, '70.—"A weak solution of the chloride of lime is said to preserve plants from insects if sprinkled over them. Flies are also got rid of in stables and other places by scattering chloride of lime on a plank. Mixed with half its weight of fatty matter, and a narrow band of the composition smeared around the trunk of a tree, insects will not pass it." I find the above in an English publication, and think it worth trying. The only question is, will it bleach the leaves of the plant? W. V. ANDREWS.

NO PLANT-LICE EGGS—*Warsaw, Ills., March 1st*, 1870.—On page 107 you mention the fact that the apple trees in the vicinity of St. Louis are remarkably free from the eggs of the Plant-louse. A careful examination of my own trees to-day failed to reveal a single one. If Dr. Hull's theory is correct, we shall escape that great scourge of the orchardist, the scab, for one year at least. A. C. HAMMOND.

"SCAB" IN APPLE vs. APPLE-TREE PLANT-LICE.

On page 107 of the present volume we showed how Dr. Hull believes that the "scab" on apples is caused by the punctures of Plant-lice, and we there expressed our opinion that the present year will prove an excellent one in which to test the validity of the Doctor's theory, since the apple trees, wherever we had examined them, were entirely free from the Plant-lice eggs.

As this is a matter of great practical importance, and of still greater scientific interest, we earnestly ask our horticultural friends, in different parts of the country, to watch carefully whether or not the Plant-lice appear in their own orchards, and whether subsequently their apples are accordingly attacked by, or are free from, "scab." We shall gladly record any facts bearing on the subject.

☞ We publish this month the first of a series of articles giving instructions how to collect and study insects, from Mr. F. G. Sanborn, of the Boston Society of Natural History. As one of the best field-entomologists in the country, and a collector of long experience, Mr. Sanborn is eminently fitted to give plain and practical directions, and will win the attention and receive the thanks of a great number of our subscribers who have been requesting such information.

MICROSCOPES.—We have received from Mr. Geo. Mead, Box 1,035 Chicago, Ills., one of his Novelty Microscopes. This instrument costs but $2 and will do well enough to amuse little folks.

ON OUR TABLE.

A GUIDE TO THE STUDY OF INSECTS.—By A. S. Packard, Jr., M. D., Salem, Naturalists' Book Agency. Part X has been on our table for some time. It is about twice as thick as any of the preceding parts, and is embellished with three full-page plates. It contains an account of the Neuroptera, Arachnida and Myriapoda, with an Entomological Calender, Glossary and Index, and completes the work. We have had all the parts bound together, and they form a good sized volume which will be found of great value and assistance to students of Entomology. We hope before long to find time to give a short review of the work as a whole.

REPORT OF THE DEPARTMENT OF AGRICULTURE FOR 1868.—We might say much in favor of this Report had we space. Many improvements have been made since the Department has been under the control of its present commissioner, Colonel Capron. There are two Entomological papers in the volume before us. The first is the report of the Entomologist, Mr. Townend Glover, and is entitled "The Food and Habits of Beetles." It is an elaborate compilation, interspersed with some original observations, and is well illustrated. It will be found of value to a certain class of individuals, but, as with all such tabular papers, numerous errors have crept in. The author is doubtless as fully aware of this fact as any one. We know that Mr. Glover must have been greatly occupied with other matters at the time this paper was being prepared, and in no derogatory mood, therefore, we suggest that any similar paper on the other Orders that may be contemplated, would prove far more valuable to the class of readers for which the Report is intended, if the avowed intention, stated in the preface, were more strictly carried out, namely, to give the vulgar name by which the insect is known, or should be known. The tyro in reading and studying such a paper would also be much less confused if the author's name were invariably attached to the scientific appellation of the insect.

The other paper is entitled "Practical Entomology for Farmers' Sons," and though anonymously inserted, we presume it was written by Mr. C. R. Dodge. It is a well prepared paper, giving correct instructions how to collect and prepare insects. There is at present a great demand for just such information as is there given, and the author would render good service to farmers' sons by striking off a number of separate copies, and transposing the headings.

ENTOMOLOGICAL RECORD FOR 1869.—We learn from the Editor that the Record for 1869 will be out early in the spring. This work is published at considerable loss to the Naturalists' Book Agency at Salem, Mass., and every entomologist should encourage the undertaking.

PEAR CULTURE FOR PROFIT.—B. P. T. Quinn—Press of the Tribune Association, N. Y.—A work which, though it has called forth some severe criticism, every pear-grower should have. We consider that portion on the diseases and insects of the pear, as singularly incomplete.

SMALL FRUIT RECORDER AND COTTAGE GARDNER.—A. M. Purdy (successor to Purdy & Johnson) of Palmyra, N. Y., has sent us copies of the above monthly. It is spicy and practical, and we hope the energetic editor will not fail of success.

LE NATURALISTE CANADIEN.—Vol. II, No. 1 of this ably edited little monthly, comes to us in a new dress, with a much embellished cover, handsomer type, and a marked improvement in the character of the engravings. M. l'Abbé Provancher is doing a good work in popularizing the delightful study of Natural History, and we sincerely wish him success in his undertaking.

INTELLIGENCE OF ANIMALS.—From the French of Ernest Menault—Charles Scribner & Co., publishers. This is a highly interesting little book, and the author is benignant and sensible enough to accord, with Montaigne, Réaumur, La Fontaine, Leroy, Cuvier, Spence, and others, a degree of reason and intelligence to the lower animals. The work is fully illustrated, and is full of amusing and instructive reading.

ILLINOIS STATE ENTOMOLOGIST.—Just as our last form is going to press, we learn that Dr. Wm. LeBaron, of Geneva, Kane county, Ills., has been appointed to the office of State Entomologist, made vacant by the death of our late associate. Well done, Governor Palmer! Our Illinois friends have good cause to rejoice at the appointment!

MISSOURI REPORTS.—We can yet dispose of a few copies of the First Missouri Entomological Report, with uncolored plates, for $1.00, or of the Second Report for 75 cents, both separately bound. Citizens of Missouri can obtain the same, bound in with the Agricultural Report, by sending 50 cents for postage, to C. W. Murtfeldt, 612 North Fifth street, St. Louis, Mo.

ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

Insects Named—*Miss Marion Hobart, Port Byron, Ills.*—The butterfly which you reared from nettle-feeding larvæ is *Grapta comma*, Harr., or the Comma Butterfly. Mr. Edwards long since found the larvæ of this species feeding on the Broad-leaved Nettle in the Catskill Mountains, though Dr. Harris bred his specimens from hop-feeding larvæ. The species is of quite uncommon occurrence with us, and we have only met with one specimen in seven years' collecting. There are four other North American species belonging to this genus, namely, *progne*, *J-album*, *faunus*, and *interrogationis*, which greatly resemble one another in the general appearance of the upper surfaces. We may at some future time take occasion to explain and illustrate the distinguishing features which separate these species. No. 2, which you bred from a "black bristly caterpillar, with reddish-brown transverse bands on the body," is a small ♂ of the Great White Leopard Moth (*Ecpantheria scribonia*, Hübn. = *Phalæna oculatissima*, Sm. and Abb.) No. 3, bred from hazel-feeding larvæ, is the Chain-dotted Geometer (*Geometra catenaria*), which also feeds on the Wood-waxen, otherwise known as Dyer's Green or Dyer's Genista. No. 4, the large black tumble-bug with a rhinoceros-like horn on the head, and which was disinterred at a depth of two feet in frozen ground, is ♂ *Xyloryctes satyrus*, Fabr. No. 5, *Arctia virgo*, Sm. and Abb. No. 6, *Cotalpa lanigera*, Linn. No. 7, feeding upon Hazel leaves, is *Serica vespertina*, Schönh. No. 8, on Milk-weed, is *Tetraopes 5-maculatus*, Hald. No. 9, *Carabus silvosus*, Say. You should always pin your beetles through the *right* wing-cover near the shoulder, and not through the scutel, or through the *left* wing-cover.

Supposed Trout Enemy—*Fred. Mather, Honeoye Falls, N. Y.*—The single small case which you send, and of which you noticed great numbers a few weeks ago with the head and legs of the bearer protruding, and climbing upon some spawn which you brought from Mr. Green's—came safely to hand, but without an occupant. It is the case of a Caddice-fly larva, and looks much like those known to be made in Europe by a genus of these flies (*Sericostoma*) comprising small species. The small dusky flies, with long antennæ, two somewhat similar caudal appendages and strongly nerved wings, which flies are very thick on the snow around the ponds which do not freeze, breed in the water, as you rightly conjecture. They belong to the *Perla* family, and the species in question is *Capnia minima*, Newp., or in English, the Diminished Capnia. The larvæ of these insects live in the water, and in general form resemble the flies except in wanting wings, and the pupa is said to be also active. The other two insects which were enclosed with these flies, and which were taken in the house, were respectively the common Cheese-fly (*Peophila casei*) and the common Brown Spice-beetle (*Ptinus brunneus*).

Food for Trout—*Seth Green & Collins, Mumford, N. Y.*—If you will send us specimens of the worm which forms such desirable food for your young trout, we may be able to suggest some method of propagating it artificially. Without specimens we are entirely at a loss as to the character of the worm in question.

Trout Enemy—*E. Sterling, Cleveland, Ohio.*—See a short article on the subject in this number.

Best Practical Works on Entomology—*Dr. G. S. Franklin, Chilicothe, Ohio.*—No entomological work ever written, condenses so much valuable information on the general facts and details of the Science, as Westwood's *Introduction to the Modern Classification of Insects*. (London, 1838-40, two large octavos with 133 blocks of outline wood-cuts, and colored plate.) It is now out of print, but is occasionally to be had of book-dealers. Kirby and Spence's *Introduction* (London, 1857, one stout duodecimo; no plates, price about $2.00) is a pleasantly written work, fraught with much valuable information on the general subject. Harris's *Injurious Insects* is preëminently *the* practical work for the American student. (Orange Judd & Co., New York; price $4.00 uncolored, $6.00 colored). Next we should advise you to get Packard's *Guide to the Study of Insects*, which has often been mentioned in our columns; and last, but not least, the Reports of Fitch, Walsh, Sanborn, and Riley. If you are conversant with the French or German languages you may find several desirable books by sending for catalogues to B. Westermann & Co. or Balliere Bros. of New York, or to any other prominent book-dealers. We have in reality no good text-book on Entomology, for Dr. Packard has signally failed to give to his *Guide* that popular character, which would have rendered it so much more valuable as a text-book. It is a valuable scientific work, and we doubt whether it is possible to make a popular text-book that covers as much ground as does the *Guide*.

Hair-Snakes—*E. W. M., West Dummerston, Vt.*—The popular belief that these so-called "Hair-snakes" are "animated hairs" is of course a fallacy. Neither are they "generated by the common field cricket," though they are often found protruding from the anus of crickets and grasshoppers, in which they are parasitic. The species you refer to was probably the Varying Hair-snake (*Gordius varius*, Leidy). Two species (*G. varius*, Leidy, and *G. aquaticus*, Gmel.) are commonly found throughout the country, but the former is most abundant. Both species occur most abundantly on the banks of fresh water ponds and sluggish rivers. They are exceedingly prolific, and Prof. Leidy says that a ♀ of *A. varius* laid 6,624,800 eggs. It is generally believed that these eggs, which are extremely minute, are drank in by insects and other animals, in whose bodies they hatch and develop, but from which abiding place they must finally depart in order to meet and copulate with some mate. But from the fact that these parasitic worms are found in many insects which are never known to frequent water, such as many of the Straight-winged Flies (*Orthoptera*), Ground-beetles (*Carabidæ*), and even Spiders, this theory hardly satisfies, and we are consequently glad to inform you that we expect shortly to publish an article on these curious parasites, from Dr. Leidy himself. These hair-snakes belong to the Intestinal Worms (*Entozoa*), which are Ringed Animals (ARTICULATA), and have nothing whatever to do with the true snakes, which are Backbone Animals (VERTEBRATA).

[Fig. 109.]

Color—Dark gray.

Egg-sack of some unknown Spider—*A. Engelmann, Shiloh, Ills.*—The curious egg-sacks which Mr. E. W. West found hanging from the twigs of an apple tree, and which we illustrate herewith (Fig. 109), are those of a spider belonging, in all probability, to the genus *Epeira*, and perhaps those of the common *Epeira vulgaris*. But we can not tell until we hatch the eggs with which the sack is now crowded. You will doubtless find full grown specimens of the spider on this same tree next May or June.

Do Worker Bees Sting the Drones to Death?—*M. W. V., Middletown, Ct.*—It is generally believed by apiarians that the workers do sting to death the drones when the mission of the latter is ended. Many careful observers assert that they have witnessed the operation, and as it is also believed by many eminent naturalists, we see no reason to doubt the say-so of Milne Edwards in his *Manual of Zoology*, though we can say nothing from our own observation.

Red Spider—*R. H. Warder, Spencer, Ind.*—The Red Spider (*Trombidium* [*Tetranychus*] *telarium*, Herm.) is an importation from Europe, and is a very minute species, pale yellow when young, becoming darker when older. It is best known in the green-house, but likewise does much damage in dry seasons on trees (especially ever-greens) in the open air. It thrives best in a dry atmosphere, and we have found no difficulty in getting rid of it by a free use of its natural enemy—water. If a little soap is mixed with the water it will be more effectual, and we also recommend the insecticide used by M. Cloez, and described on page 86 of this volume.

Preserving Insects—*Jos. McGuade, Fort Ripley, Minn.*—We commence in this number a series of articles which will give you the desired information. Meanwhile, if you need full directions immediately, we will send you a small pamphlet containing an article on the subject, upon receipt of 30 cents.

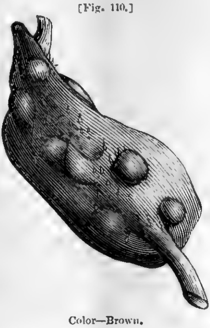
R. E. Whitney, Lamar, Mo.—Your query is answered in the preceding paragraph.

Insect Named—*M. Barrett, Waukesha, Wis.*—The flies you send are the *Psocus venosus* of Burmeister, belonging to the Order of Net-winged Flies (NEUROPTERA). They feed on the lichens found on the bark of apple trees, as we have ocularly demonstrated, and are therefore harmless. Certain minute species of the same genus, however, and which are known as book-lice, are very destructive to books and to insect collections.

√ **To Destroy Plant-lice**—*B. F. Lazear, Louisiana, Mo.*—If you cannot so cover your house-plants as to give them a good smoking with tobacco, wash them well with strong soap-suds, or quassia-water, or sprinkle them with the fine tobacco-dust which can be obtained from tobacco factories.

Raspberry Root-gall—*Katherine Parsons, Cambridge, Mass.*—The galls found on the roots of a raspberry bush, and of one of which we here produce the outline (Fig. 110) were long ago mentioned by Harris (*Inj. Ins.*, p. 549). They are produced by a little gall-fly described by Osten Sacken as *Rhodites radicum*, and they occur on the roots of other plants belonging to the Rose family, and especially on those of the Rose itself. The little white larvæ which are snugly enclosed in the cells, scattered throughout the pithy yellowish substance of the gall, will soon transform to pupæ, and in time produce the flies; but the gall itself is so apt to be sponged upon by other guest-flies, and the gall-makers are so subject to the attacks of parasites, that flies belonging to the different genera *Eurytoma, Callimone, Ormyrus*, and *Eupelmus*, have been bred from this gall, according to Baron Osten Sacken. Indeed, so unsafe is it to conclude that because we breed a certain fly from this gall, therefore said fly must be the gall-maker, that even Dr. Harris fell into the too common error of describing as the gall-maker, another fly (*Cynips* [?] *semipicea*) which was in all probability a parasite. It becomes a curious question, how so many guest-flies manage to discover this underground swelling of the root, or how so many parasites succeed in reaching the hidden gall-maker; and there is plenty of room for original observation and discovery in this, as in every other field of Nature.

[Fig. 110.]



Color—Brown.

Spined Slug-worm—*Levi G. Saffer, Elizabeth, Ind.*—The green oval flattened object with lateral tooth-like appendages fringed with hairs, the two at the tail being larger than the others, is the larva of an undescribed species of *Limacodes* or Slug-worm. It belongs to the very same family as the "Saddle-back" [Fig. 36 of this volume]. When living, it is ornamented with a lateral row of minute ocellated spots, each with a black dot, and a dorsal row of darker spots with two of a rich scarlet color. You will find a colored figure of it in Harris's Correspondence [Pl. II, Fig. 7], and also a magnified view [Pl. III, Fig. 6]. We regret that you cannot tell upon what it fed.

A. R. Bodley, Sturgis, Mich.—The green sprangling worm which you erroneously suppose was ejected by the larva of the Polyphemus moth, is the same species spoken of above.

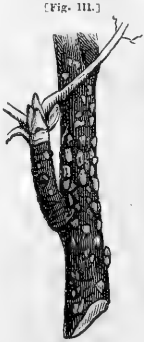
Fern Insects—*Beulah S. Morris, Philadelphia, Pa.*—The minute fern insects were dead and unrecognizable when they arrived. Please send us more in a tight vessel, according to the directions at the end of this Department.

Ants do not Breed Plant-lice—*H. C. Raymond, Council Bluffs, Iowa.*—We have not seen the copy of the *Iowa Homestead* which you refer to. Of course you are right about the ants, and the correspondent of the *Homestead* shows great ignorance on the subject.

Apple-tree Insects—*L. Camfield, Benton Harbor, Mich.*—The insects you send are as follows: No. 1, cocoon of the White Marked Tussock Moth (*Orgyia leucostigma*, Sm. & Abb.), containing the empty ♂ chrysalis shell. No. 2, the same. No. 3, the cocoon of the same species with the eggs of the ♀ attached. These eggs would soon hatch out into beautifully tufted caterpillars, which prove very destructive to the foliage; but by destroying the eggs at the present time you of course effectually prevent the hatching of the worms. You should, however, only destroy those cocoons which have eggs on the outside, as all the others either contain the harmless ♂ chrysalis shell, or else some parasite. At Figure 67 of our first volume, you will find an illustration of this worm. No. 4, are the silky cases of the Leaf Crumpler (*Phycita nebulo.*) They now contain worms, and should be carefully plucked and destroyed before the leaves expand. These worms, which attack both quince, crab and plum trees, produce little gray moths in June.

Native Apple-tree Bark-lice—*A. C. Hammond, Warsaw, Ills.*—The apple twigs you send, which are speckled over with small white paper-like scales, are infested with the Native Apple-tree Bark-louse (*Aspidiotus Harrisii*), as you will at once perceive by the accompanying Figure 111, which represents such an infested twig. You will find a full account of this insect, with the proper remedies suggested, in Mr. Walsh's First Report, as acting State Entomologist, or in our First Missouri Report. The species occurs on the Pear and Mountain Ash, as well as on the Apple, and though it has in a few instances multiplied sufficiently to do serious harm, yet these are the exceptions, and not the rule, for it is so effectually preyed upon by parasites and cannibals that it is little to be feared, and you need not feel as much alarm as though you had the imported Oyster-shell species on your trees. Encourage the lady-birds, especially the Twice-stabbed Lady-bird, which has several times been figured in back numbers.

[Fig. 111.]



Colors—White, with blood-red eggs underneath.

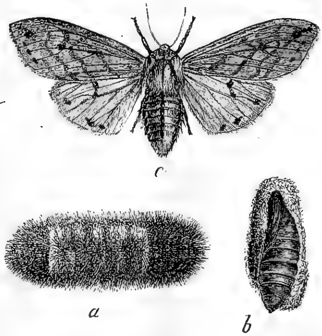
Entomological Works—*R. W. Bryan, Pomonkey, Md.*—See what we have said in answer to Dr. G. S. Franklin in this number. There is no work extant that meets your demands; nor do we believe one could be made. We shall soon publish a table such as you suggest. Yes, we *have* published articles on the Peach Borer, and refer you especially to the practical one on page 180 of the first volume. Shall be glad to receive notes from your locality.

"Novice," Amesbury, Mass.—We refer you to the above answers.

"Sow-bugs"—*E. P. Allis, Jr.*—Sow-bugs (*Porcellio*) are harmless, as they feed upon rotten wood and decomposing vegetable matter. They delight in damp places, and this is the reason you find them in your fernery. They are not true insects, but belong to the same Class (CRUSTACEA) as the lobster.

The Hedge-Hog Caterpillar—*Huron Burt, Williamsburg, Mo.*—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 the Isabella Tiger

[Fig. 112.]



Colors—(*a*) Brown and black; (*b*) brown; (*c*) dull orange and black.

Moth (*Arctia Isabella*, Hübn.) The moth is of a dull orange color, with the front wings variegated with dusky, and spotted with black, and the hind wings somewhat lighter and also with black spots. The caterpillar is one of those which passes the winter as a caterpillar, rolling itself up like a hedge-hog, and seeking some sheltered place. In the spring it becomes active and "feeds up" on the first green blades of grass which it can obtain, after which it undergoes its transformations in the usual manner. These worms cannot be considered injurious, and the supposition that they cause the fever, whence they are called "Fever-worms" in your locality, is of course unfounded and erroneous. A much larger and entirely black prickly worm (larva of *Ecpantheria scribonia*, Hübn.), and closely allied to it, which occurs quite abundantly in the southern swamps, is likewise dubbed "Fever-worm" by the negroes, under similar false impressions of its injurious powers. As the miasma of the swamps induces ague, and as this worm is found abundantly in such situations, the two circumstances have doubtless been associated through ignorance, and some Ethiopean, right from Dixie, has perhaps perpetuated the name in your vicinity, by applying it to our more northern Hedge-hog Caterpillar. The Isabella Tiger Moth is illustrated at Figure 112, *a* giving a back view of the larva, *b* the cocoon cut open so as to show the chrysalis, and *c* the moth. The beetles which you found under the bark of a fence rail, may be known by the name of the Sleek Horinus (*Horinus lævis*, Oliv.) They feed on rotting wood.

Chick-weed Geometer—*J. Huggins, Woodburn, Ills.*—The pretty little orange moth marked with pink, is the common Chick-weed Geometer (*Hæmatopis grataria*, Fabr.), the transformations of which were first described in the First Missouri Entomological Report, where you will find the insect figured. The many-legged animal is *Cermatia forceps*, and is common in houses in this latitude. You will find your Canker-worm queries answered in the Second Missouri Report. Of course you are right about the absurdity of the sulphur remedy.

Bean-weevil—*Geo. W. Copley, Alton, Ills.*—The weevils which infest your beans are in reality the very same Obsolete Bean-weevil (*Bruchus obsoletus*, Say) spoken of on pages 118 and 125 of this volume. We have lately been informed by Mr. J. F. Wielandy, of Jefferson City, Mo., that his father, who is a resident of your county, has been much troubled with the same pest. The little case in the cartridge box is the larva-case of a small narrow-winged moth, belonging, in all probability, to the genus *Solenobia*, and closely resembling that of *Solenobia Walshella*, Clem. We cannot believe that it gouged out the twig of the Bartlett pear; but incline to the opinion that this gouging was done by some other insect, and that the case-bearer simply took shelter in the hollow, to gain protection from the winter's blasts. The species has never been bred, and we should be glad to have you send us as many cases as you can find. The pretty little leaf-beetle, bearing some resemblance to the 12-Spotted Diabrotica is *Cerotoma caminea*, Fabr. *Attacus cynthia* is the moth you may send us.

Bag-worm at South Pass, Ills.—*G. H. Baker, South Pass, Ills.*—Your insects on Black Spruce, are the notorious Bag-worm, for an account of which see pp. 35–8 of the present volume. The fact of their occurring in your locality is an entirely new one, for we have never noticed the insect during our visits there; nor have we ever heard of its occurring there before. In all probability it is yet confined to your grounds, and upon reading the article referred to above, you will at once perceive how important it is to the South Pass community, that you search for and destroy every one that can be found. A single follicle was, in all probability, originally introduced into your grounds upon spruces from some distant nursery.

Injured Pear Roots—*G. Pauls, Eureka, Mo.*—The corrugated pear roots bear no trace of insect work. We can throw no light on the subject. Perhaps the appearance is produced by their getting too dry before planting, and thus causing the bark to split open.

Eggs of Oblong-winged Katydid—*E. D. Ladd, Lawrence, Kansas.*—The eggs which you found on a currant sprout are those of the Oblong-winged Katydid (*Phylloptera oblongifolia*, DeGeer). They occur on a variety of different trees, and differ from those of the common Broad-winged Katydid in being narrower in width but thicker in depth.

Insects Named—*W. H. Patton, Waterbury, Conn.*—Your insects are: No. 1, *Chrysochus auratus*, Fabr. (see A. E. I, p. 249, and II, p. 27); No. 2, *Polistes fuscatus*, Fabr.; No. 3, ♂ and ♀ *Calopteron reticulatum*, Fabr. (see A. E. II, p. 31); No. 4, *C. terminale*, Say.

TAKE 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, 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 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.

☞ Our readers will confer an especial favor by addressing all letters of a business character to the publishers, as the editor has no time to attend to such letters.

Lin. Coll. Lep

Botanical Department.

GEORGE VASEY, Editor, Richview, Ills.

TO OUR READERS.

In entering upon this department, it may be expected of the Editor that he define his position. We feel the importance of a more general diffusion of botanical information. Very many persons have little or no pleasure in looking into a scientific text book. The information is there usually conveyed in the tersest technical language. In these pages, though we may present little matter that is absolutely new, we hope to present something each month that shall be intelligible and attractive to the popular reader. We do not mean to discard the scientific; on the contrary, we hope to have a place for the researches and observations of the learned; but there is a numerous class of readers who will be better interested by familiar language, an easy style, and more detailed description.

By these means, and by suitable illustrations, we hope to extend among our fellows an acquaintance with our native plants, especially where this knowledge may have any bearing upon general industry or utility.

We know that the love of Flowers is almost universal. We propose here to cultivate, not only the taste for the beautiful and ornamental, but to direct attention to the less obvious, but not less wonderful, developments of structure and functions, observable in the humblest as well as the most showy plants. We intend to devote especial attention to our native forest trees and shrubs, and to urge our people to an acquaintance with them, and to a cultivation of them both for purposes of ornament and utility.

Here we hope, also, to have a place where our botanical friends may freely record their observations on any peculiar, interesting, or rare plants of their region. And for those who love plants, and have not the time or the facilities needed for looking out their names, we shall have a column where their inquiries may be answered.

We wish for and solicit contributions, on subjects pertaining to this science, from all parts of our extended country.

Our first efforts in this work may not equal our desire—for we labor under disadvantages—but we trust to secure a growing interest *in* and *for* this our new enterprise.

SPRING FLOWERS.

With what interest do we watch the first appearance of vegetation in the spring. On warm, sunny slopes in open woods, peeping out from masses of fallen leaves, we find the Claytonia and Hepatica expanding their delicate petals to receive the first genial rays of the sun.

The Claytonias.

[Fig. 113.]

Claytonia Virginica.

These form a genus of delicate, handsome plants, belonging to the Portulacca family. Two species are found more or less plentifully in all the States east of the Mississippi; they are *Claytonia Virginica* (Fig. 113) and *Claytonia Caroliniana* (Fig. 113), and are commonly known by the name of Spring Beauties.

If we dig away the soil from the plants we shall find that they spring from small brown

[Fig. 114.]

tubers, buried several inches below the surface. Each tuber sends up from three to ten plants, which consist of weak, slender stems, five to ten inches long, with one pair of leaves placed opposite each other, and terminated by a loose raceme of flowers. The flowers are about half an inch in diameter, have two sepals, five small rose-colored petals, five stamens and a pistil with a three-cleft style, and the base or ovary of which becomes a capsule or box containing a few small, shining, black seeds.

[Fig. 115.]

Claytonia Caroliniana.

The two species resemble each other closely, but are distinguished by the oval pointed leaves and the larger sepals of *Claytonia Caroliniana*, Michx., and the long, narrow, nearly grass-like leaves, and short sepals of *Claytonia Virginica*, Linn.

The specific names would indicate that one is a Carolinian and the other a Virginian species. In the early history of our country all the Atlantic coast, with the country stretching back indefinitely, was claimed by the English and French, under the names of Virginia and Carolina. Many of the plants of the New World were named by Linnæus from specimens and descriptions sent him by the early explorers, and frequently the portion of country from which they were received was indicated by the specific names we have mentioned.

One of the plants we have under consideration was named by him Claytonia, in honor of John Clayton, an American Botanist then living in Virginia; and the specific name Virginica was applied to indicate the portion of country where it was obtained. The other species was named by a French Botanist, Michaux, probably from specimens procured in that portion of the country then called Carolina. By further explorations it was discovered that neither of the specific names were strictly appropriate; but, according to the prevailing rules, they have to be retained.

There are several other species of Claytonia in the United States. One (called *Claytonia chamissonis*, Esch., or *C. aquatica*, Nutt.) is found in Colorado and other portions of the Rocky Mountains. It is very delicate, three to six inches high, with five to ten pairs of leaves, and grows in springs and cold brooks. The stems are weak, reclining, and frequently rooting at the joints.

The most singular species we have is a Claytonia growing on high peaks in the Rocky Mountains, above the tree limit or timber line, which is generally at an altitude of 12,000 feet or more. It has a thick root, six to twelve inches long, frequently growing in crevices of rocks and among masses of granite blocks, where it would seem that it could obtain no nourishment. From the summit of the root proceeds a mass of leaves and flowering stems. The leaves are three or four inches long, thick and succulent, with a broad obovate summit, tapering below to a long, narrow margin. The flowering stems are much like those of *Claytonia Caroliniana*, but thicker and more juicy, with rather larger flowers and capsules. Frequently one root produces twenty or thirty leaves and stems, which when in full bloom (about the first of August) presents a beautiful appearance. It is more robust in its habit than any of the genus, and, on account of its long, thick root, was called by Dr. Parry (who discovered it several years ago) *Claytonia megarrhiza*, or large rooted Claytonia, but Dr. Gray considers it a variety of *Claytonia arctica*.

Another Claytonia is found in California and Oregon. In this the pair of stem leaves usually grow together at the base so that they seem to be one leaf with the stem growing through the middle, and hence it is called *Claytonia perfoliata*, Donn.

THE SOFT MAPLES.

There are two trees which are indiscriminately called Soft Maple, namely: 1st. The Silver-leaf or White Maple (*Acer dasycarpum*, Ehrh); 2d. The Red Maple (*A. rubrum*, Linn.) They are called Soft Maples on account of the comparative softness of their wood, which is due to their vigorous and rapid growth. They stand foremost in the rank of trees adapted to cultivation either for the lawn and garden, or for fuel and timber. In general appearance these trees resemble each other so closely that many people fail to discriminate between them. In order to aid in their distinction we will give a short account of them.

The Maples, in their flowering arrangement, are polygamous; that is, the flowers may be either perfect, or the staminate or pistillate kinds may be separated in the same or in different trees. Probably, however, the Soft Maples are generally diœcious; that is, all the flowers of one tree are staminate, and all the flowers of another are pistillate.

But, how many of our readers will say that they never saw maple flowers? Well, then, look about you in this month of April, and you may find new pleasure in these beautiful trees. If, however, you are far south, you may be too late for the flowers this season, and may have to content yourselves with a view of the fruit only.

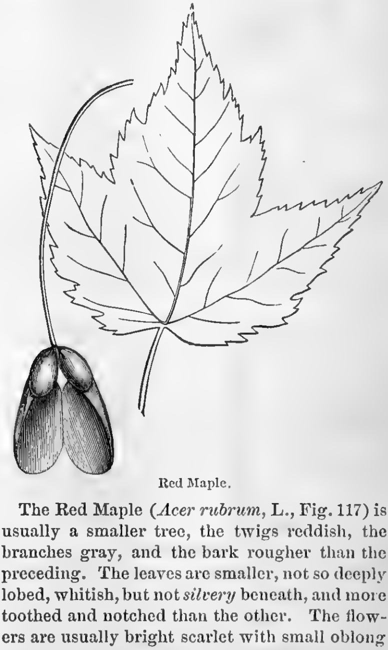
First, let us describe the Silver-leaf Maple *Acer dasycarpum*, Ehrh, Fig. 116.) The flowers

[Fig. 116.]

Silver-leaf Maple.

are in small clusters proceeding from lateral buds, which are developed before the leaves appear. Each cluster or fascicle contains five or six yellowish or purple flowers, either perfect—*i. e.*, with stamens and pistils—or containing only one kind of organs. The staminate flowers have each four or five stamens; the fertile flowers have each two pistils united below, and expanding into a pair of long, broad wings or keys (*samara*), which are quite downy when young, and when mature are about two inches long. The stalk or pedicel of these keys is very short at first, but it elongates so as to become an inch or more in length. Each key contains one large seed. They mature and drop from the tree in May. The leaves are large, with three to five lobes, pointed and toothed, or, sometimes again divided into smaller lobes. They are downy when young, becoming silvery-white on the underside. The tree attains a large size, the wood is white, the bark ash-colored and smooth, except on the large trunks. The leaves present considerable diversity of form—our illustration shows leaf and fruit, a little less than full size.

[Fig. 117.]



Red Maple.

The Red Maple (*Acer rubrum*, L., Fig. 117) is usually a smaller tree, the twigs reddish, the branches gray, and the bark rougher than the preceding. The leaves are smaller, not so deeply lobed, whitish, but not *silvery* beneath, and more toothed and notched than the other. The flowers are usually bright scarlet with small oblong petals; the wings or keys smooth, when mature about an inch long, and on long, drooping stalks. The wings of fruit are smaller, smoother, less spreading or diverging from each other, and on longer pedicels than the other species. The tree usually grows in wetter ground, but will flourish when transplanted to high and dry soil.

These are the usual and more prominent distinctive points between the two species, but there is such a diversity in the leaves, that it is sometimes difficult to decide, without flowers and fruit, to which species a given tree belongs.

The presence of *petals* in the flowers of the Red Maple, and the size and downy state of the *fruit* of the Silver-leaf Maple, will be reliable indications of the species. In Southern Illinois there will probably be no fruit on the Silver-leaf Maple during the present year on account of a severe frost which has injured the flowers just as they were about to expand.

WHO SHOULD STUDY BOTANY?

The school boy and school girl, who so often ramble in the woods gathering flowers and seeking recreation and amusement, will find their interest in the fields and woods vastly increased by a knowledge of this science. They will be constantly making new discoveries in their search among rocks, by the brook, or in the fields and forest. Let them learn how to preserve specimens, and to arrange them in an herbarium, that they may have them at hand for comparison with other species, and that they may yield pleasure in wintry days when Nature is in her annual sleep.

There are hundreds of young men and young ladies in our academies and colleges who study Botany much as they study grammar—in their text books—who would find their interest in the study vastly increased, as well as find health, and refreshment from their weary mental toil, by a daily ramble in the fields seeking plants and objects of interest in Nature. How few of those who finish their education in the colleges go forth with a practical acquaintance with Nature! Probably forty or fifty species of trees are in the forests around them, and yet few can accurately identify a dozen kinds. They are probably quite as ignorant in the other departments of natural science. These things ought not to be.

All persons of sedentary habits, including clerks, teachers, clergymen, and other persons whose occupation keeps them much within doors, would find relief mental and physical, vigor, rational and satisfactory enjoyment, by forming an acquaintance with the various natural objects presented around them. Their enjoyment of a walk would be tenfold increased. They would find hundreds of objects of interest which before escaped their attention.

Horticulturists and florists, from the nature of their business, have more or less acquaintance with Botany, and their toil is cheered and doubly rewarded by their knowledge of the beautiful science. But too few even of this class extend their inquiries beyond the immediate field of their labors.

But what shall we say of the farmers, to whom everything is a weed which does not bring dollars, and whose plow and hoe are ready to cut down every plant which dares lift its head in the place allotted to cultivation? You have plenty of room, dear friend, in the garden and in out of the way places, to give the flowers a chance, and you need their kindly influences to cheer you in your daily labors. Open your heart to the sunshine and beauty of Nature, and you may render your toil more agreeable. Perhaps no class of men are better situated for a study of Botany, or have closer practical relations to it than farmers. The cultivation of that field of corn may appear a more dignified labor if you consider the history, the structure, and the value of that noblest grass which God has given to the human race.

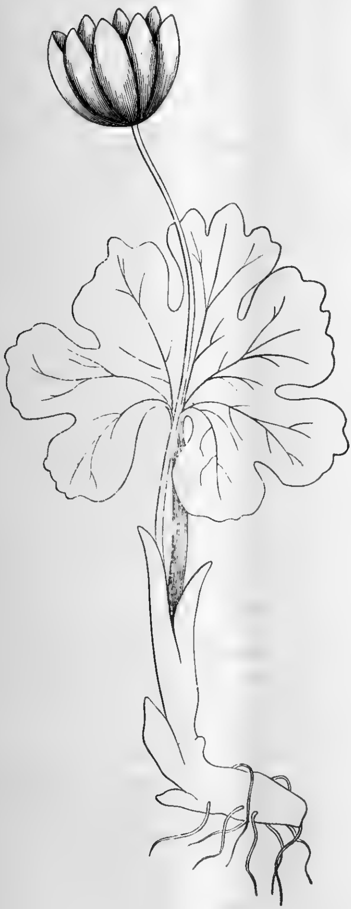
Nothing is more calculated to increase our enjoyment of life than a love of Nature. We derive pleasure from an examination of works of skill in art. We look upon a painting perhaps, and we find our admiration excited by the display of the genius of the painter. The picture is life-like—there is harmony of color—there is expression—there is a just proportion of parts. But we need attention and culture in order to a full appreciation of the beauties of a painting. An uncultivated person might pass through a gallery of the finest works of art and not recognize their superior claims. So it is with the works of Nature. They are displays of the skill of the greatest Artist. They are the works of an unequalled Master. But we may spend a life-time among these objects and never half appreciate them. We need to cultivate habits of observation, thought, investigation. A glance at a rose gives us pleasure—its form is symmetrical—its color is attractive—its fragrance is delightful. But if we also consider its structure, its various organs, the wonderful secrets of its vital operations—its relations and connection in the great system—it then gives us much greater pleasure. Many humbler, less showy plants we meet with daily, which, with a little investigation, would speak with equal force to us of the wisdom and goodness of the Creator.

In some cases, where the nectarium of a flower is not perceptible, if the spur of such a flower—which usually becomes the depository of the nectar that has oozed from the capsules secreting it—be too narrow for the entrance of a bee, and even beyond the reach of its long tongue, it contrives to attain its object by biting a hole on the outside, through which it taps the store.

BLOOD-ROOT.

(*Sanguinaria canadensis.*)

[Fig. 118.]



Blood-Root

The Blood-root is one of our prettiest spring flowers. It is usually found in rich woody slopes, among thickets of hazel, or in other warm sheltered places. Very few except the botanist, or those who are acquainted with its early habit, ever get into the woods in season to see its handsome white blossoms.

The cut which we give of this plant represents the leaf more fully expanded than is common at that stage of the flower. The leaves are mostly quite small, and folded together when the flower expands, but during summer they spread out to be four or five inches across. That part which is commonly called the root of this plant is really a thick, prostrate stem, developing each year a new bud from its extremity. The small fibres which proceed from this stem (called *rhizoma*) are the true roots. The flower, as will be seen, is raised on a slender naked stem about six inches long. Before expansion it is wrapped by two large greenish leaves, which drop off as soon as the flower opens. It then displays usually eight or ten pure white, oblong petals, twenty or more small delicate stamens, and a pistil, or germ, which, after the decay of the flower, expands into a thick oblong pod, filled with seeds. The *rhizoma*, or ground-stem, contains an acrid juice of a reddish color, which has valuable medicinal properties, and consequently the root is often sought for and collected for medical purposes.

This plant is deserving of more attention for the garden. It may be transplanted with ease, and a small bed in flower will be a fine ornament. Its natural habit should be imitated as far as possible in cultivation. After flowering cover the bed with a thick coat of leaves or litter, to protect it from the heat of the summer sun.

RED-BUD.

(*Cercis canadensis*, L)

The Natural Order *Leguminosæ* embraces in this country only a few trees, the principal of which are the Black Locust, the Honey Locust, the Coffee-tree, and the Red-bud. The latter will engage our attention at the present time.

The Red-bud (*Cercis canadensis*, L.) is a small tree occurring in most of the Western and Southern States. It seldom exceeds twelve or fifteen feet high. It is very ornamental, particularly when in bloom. The flowering occurs before the development of the leaves, and from the size and abundance of the flowers the tree is a conspicuous object at a great distance, and where the trees are numerous the whole forest seems ablaze with their rose-colored flowers. After the fall of the flowers, when the tree gets into full leaf, it is still an object of beauty. The leaves are heart-shaped, three or four inches in diameter, of a lively green and smooth surface; and when the pods are added, hanging in graceful clusters below the leaves, the appearance is highly attractive. The time of flowering varies with the latitude of the locality: in Southern Illinois in April; farther south, earlier; farther north, later.

This tree belongs to the second section or sub-order of the great Pea Family (Sub-order *Cæsalpiniæ*). The flowers are in small clusters from the buds of the preceding year's shoots. They are not strictly *papilionaceous* in their structure, the standard being smaller than the wings, and the lower petals not united to form a keel, and the ten stamens are separated. The pods, when mature, are flat, about three inches long, half an inch wide, and contain five to ten seeds.

There is a tree of the same genus in Europe called Judas-tree (*Cersis siliquastrum*) which tradition records as the tree on which Judas hanged himself. Another smaller and very ornamental species has been introduced into cultivation from Japan.

THE GRASSES.

The Family of Grasses (*Gramineæ*) is one of the largest as well as most important in the Vegetable Kingdom. The term grass, however, has a more extended common signification than is strictly correct. Thus, it is commonly employed for the Sedge Grasses (*Carices*), and other plants of the Natural Order *Cyperaceæ*. It is also applied to Bulrushes (*Juncus*), and frequently, also, but very erroneously, to any kind of plant cultivated for hay, as clover. Perhaps it is not practically important if we do include under the one general name of grass the plants of those two closely related orders. Still, it is quite necessary that we have an understanding of the scientific differences existing between them, because we cannot be correctly understood when speaking of any thing without precision in the use of words. The most prominent differences between the true grasses and the sedges may be stated as follows:

The Grasses generally have the *culm* or stem hollow, except at the joints. When the stem bears leaves, they are two-ranked, or on alternate sides of the stem, and hence the stem is usually round. The leaves, where they issue from the stem, usually clasp it closely for a certain distance, but are *not united* at the edges. A few moments' inspection of a stalk of common Indian corn will show this character of the leaves.

The *Sedges* generally have solid culms or stems. The leaves are usually three-ranked, and hence the stem is usually triangular. The base of the leaves not only sheathes the stem, but the opposite edges are united for a certain distance, so as to form a tube, fitting closely around the stem. This arrangement may be distinctly seen in many of the coarse sedges growing in wet ground. There are other differences of flower and fruit which it is not easy to describe without an analysis of specimens, but a little acquaintance with some representative plants will enable one readily to distinguish a grass from a sedge.

There is another small Family of Rush-grasses (*Juncacæ*), which differs in character from either of the preceding, but have the general appearance of grasses, and are not ordinarily distinguished from them. Species of each of these three families will commonly be found in any of our natural meadows.

All our cultivated grasses and grains belong to the family of true Grasses (*Gramineæ*). The number of species of these cultivated kinds is, however, only a very small proportion of the whole number of species in the family. The larger part of our native grasses escape general observation. They clothe our prairies and low grounds; they spread among our woodlands and forests; they extend over our hills and reach to the tops of the mountains. Some species are cosmopolitan and are at home in all parts of the globe; the most, however, are especially adapted to certain kinds of soil, or climate, or elevation. In number of species the family of Grasses is second only to the large order of Compound Flowers (*Compositæ*). Over two hundred species are found in the Northern United States, east of the Mississippi river. Still more numerous is the family of Sedges (*Cyperaceæ*). A goodly proportion of these numbers may be found in almost every township.

It is singular that the New World has furnished only one additional species of grain to the agricultural resources of the husbandman; that one grain, however, is the Indian Corn (*Zea mays*, L.), of greater importance, perhaps, in usefulness and adaptation to a great variety of climates than any other.

The Sedge Grasses are generally inferior in nutritive qualities as food for grazing animals, and hence none of them are cultivated by the farmer. In the natural meadows and sloughs, however, they form a very important part of the vegetation. They are particularly adapted to low and wet situations, furnishing there a permanent reliance for stock, especially in newly settled portions of the country. The most valuable of these are probably certain species of the genus *Carex*, as *Carex stricta*, Lam., *Carex* *aquatilis,* Wahl, *Carex vulpiniodea,* Michx., and *Carex trichocarpa,* Muhl.

We may in future numbers take up these grasses and sedges, and examine them more in detail.

THE SPICY WINTERGREEN.

(*Gaultheria procumbens,* L.)

We find the following in an old number of the *Rural New Yorker,* and it is written in so charming a style, and shows such an intimate acquaintance with the plant, that we print it in hope that it may give our readers as much pleasure as it has given us. The Wintergreen is little known at the West; in this State we only know of a few localities on the Lake shore north of Chicago. Our Eastern readers will readily recognize it. It is also sometimes called Checkerberry:

Who does not love the Wintergreen with its pleasant, spicy flavor, and its rich scarlet berries. How glossy are the leaves with their brilliant green. And then how charmingly hang the pendant bowl-like blossoms, hid almost beneath those same beautiful leaves. Meek and humble though these flowers are, yet they guard treasures dear as life, which they hedge about with an unspotted garment of innocence. Would the casual observer suspect so much worth and goodness lay concealed in these humble plants? Among the fields of humble life, lie hidden many jewels of inestimable worth. Hearts throb in the lower walks of society that would honor angels, especially if the angels were earthly ones. So the most merit often makes the least show, and must be sought out to be known and appreciated.

Through all the vicissitudes of weather the Wintergreen holds its unchangeable greenness, being endowed by nature with a vitality that endures, unchanged, the rigors to which it is subject. As winter approaches we find the flowers have given place to beautiful scarlet berries. These are nearly globular, and at first sight show no particular singularity; and yet there is infinite wisdom displayed in that organization. There is a thorn-like filament extending from the apex of the fruit. This is the persistent pistil, from which you notice five sutures, or lines taking their departure towards the stem, stopping, however, before half the distance is traversed. The divisions made by these lines are readily elevated, beneath which you discover a nice five-angled capsule with five apartments filled with seed, which are thus safely sheltered from wintry rigor. The envelop of the capsule is the original calyx of the flower now swollen into a berry, that will by spring have arrived to its full maturity, when its color is of deep scarlet and its flavor most delicious.

The generic name of the Spicy Wintergreen is *Gaultheria,* given it in honor of one Gaulthier, a French physician of Quebec. It is in the *Decandria Monogynia* of the Linnæan System, classed naturally among the *Ericaceæ* or Heathworts, where are also found the Whortleberries, Cranberries, etc. In this order are found sixty-six genera and one thousand eighty-six known species diffused in all parts of the globe, but more rarely in the torrid regions. But a few species of this order are poisonous, some are medicinal, while the fruits of others are wholesome and nourishing. T. E. W.

NOTES ON SOME WISCONSIN PLANTS.

To one who is accustomed to look upon our species of the Evening Primrose—*Œnothera biennis, Œ. fruticosa, Œ. Missouriensis,* or even the gaudy *grandiflora*—as types of that family, the little *Œ. pumila* is, when beheld for the first time, quite a curiosity. Such it was to me last summer, when I found it unexpectedly in my travels in the northern part of Wisconsin. In this I purpose to give a brief description of this interesting little plant, its habits, etc., together with a few more of the most interesting plants I found in the same locality. In general all the representatives of this family we have are found scattered about among fields and waste places, while a few of the more showy ones have found a place among the garden exotics. This species of the Primrose I found growing in the richer portions of that exceedingly poor soil to the height of from three to ten inches, with the foliage having the general characteristics of our species, and the stem bearing upon the top one or two bright yellow flowers, as small proportionally as the plant, but having plainly marked the characteristics of the genus.

Associated with this, though usually a little larger, was the Rock Rose (*Helianthemum corymbosum*), a delicate little plant of lighter foliage and lighter yellow flowers; also, the Sweet Fern (*Comptonia asplenifolia*). Growing in the marshes and lower grounds of the same locality, I found one of the Orchidaceous flowers (*Platanthera psycodes*), that far excels in beauty many of our garden flowers. I usually found them about a foot high, each stalk bearing from two to four flowers, whose brilliant colors made the plant very attractive, either as seen in the distance or when placed among other specimens for preservation or ornament.

Many have remarked that the State of Wisconsin was modeled after the State of New York in its laws and institutions. One would think that not only its laws, but also its flora, was an imitation of the same type, Nature having taken the lead and the people following in her train. I found there many plants that I had not seen since seeing them in the State of New York, such as the Pipsisiwa (*Chimaphila*), Wintergreen

(*Pyrola rotundifolia*), the common Wintergreen (*Gaultheria procumbens*), Lady's Slipper (*Cypripedium*), and many others too numerous to mention here. Indeed, I might say that the whole general aspect of the middle and northern middle of the State resembles that of Central New York much more than that of either State does the flora of Illinois. In looking for a cause for this, it seems very probable that this similarity is due, not to any chance transfer of similar seeds to that particular locality, or to a similarity in climate, so much as to a similarity in geological formation, though both the others may have their influence. The central part of the State of New York lies mostly in the Devonian or Old Red Sandstone formation, as also does the part of the State of Wisconsin above referred to, while the greater portion of Illinois (surface of course) is the Carboniferous or Sub-carboniferous. In the northern part, where we have the lower part of the Sub-carboniferous, or it may be the formation immediately below that, we have some plants characteristic of certain localities and conditions in New York where we also find the same geological formation, as the Pitcher Plant (*Sarracenia purpurea*); while further south, I believe, they are not found. My deductions may not be correct in this case, though if not, there is a strange coincidence of circumstances.

Another interesting plant I found on my travels was the Hare Bell (*Campanula rotundifolia*). Though that grows in Illinois to some extent, on the banks of some of our rivers, yet I have never found it in so great abundance as in some parts of Wisconsin. The soil seems to be more adapted to its growth, as I found it frequently from half a mile to one or two miles back from the rivers, its usual habitat being nearer the water.

It may be that some of your readers would be interested in the general character of the soil of particular localities, as well as the flora. I spent some time in Adams and Wood counties, Wis., and from my observations can say that, in an agricultural point of view, the soil is not very inviting. It consists mostly of loose sand, though it is not blown about as in some parts of Michigan, having some vegetable mould in its composition. There are places, however, where it is, to all appearance, nothing but sand, and looks about as inviting to a farmer as an ash heap. The only plants I found on such places were a species of Horse Balm (*Monarda punctata*), a straw-colored Cyperus growing from ten to fifteen inches high, some Sand Burs (*Cenchrus tribuloides*), or something else of a similar nature. The forest trees are mostly Burr Oak (*Quercus macrocarpa*), so stunted as to have gained the general appellation of Scrub Oak, and Scrub Pine (*Pinus Banksiana*), with these not near enough together to be neighbors. This is not the picture of the whole country, for there are places where the soil has a larger mixture of humus, and in such places the Pines in a measure disappear, or stand like grim sentinels in the distance. In such places there occur the Black and some other kinds of Oak, with other trees; in the northern parts White and Norway Pines (*Pinus strobus* and *resinosa*), though the general timber country for these pines is still further north. Between these two extremes of good and bad are found places where the Scrub Pines do not disappear, but are seen to attain a more respectable size. This kind of pine is valued but very little for timber. Interspersed with these were Hazel bushes (*Corylus Americana*), Sweet Fern and Rose Willow (probably *Salix tristis*), with occasionally other varieties in the lower grounds. Among other marsh plants there were plenty of Cranberries (*Oxycoccus macrocarpus*), which fruit, together with Blue Berries and Huckleberries, forms quite an article of commerce, by which the white inhabitants are enabled to obtain many little luxuries, and the Indians whisky.

In some localities where the tillage had been good I saw good crops of wheat and rye growing, though corn looked as though the plants grown last year would have to be wintered over and started again this spring in order to get a crop; and, as a whole, the cereals did not seem to be very remunerative. Hops seem to be the most productive crop that can be raised in that country, as they grow luxuriantly under the cultivation usually given them—even growing wild on the flats of the Wisconsin.

As one might suppose, there is a great deal of this country that is not under cultivation, in some places the houses being from six to nine miles apart, and that on a stage road traveled every day. G. H. F.

IRVINGTON, Ill.

RED SNOW.—In Alpine regions the fields of snow sometimes suddenly appear as if stained with blood. Upon close examination by the microscope, this phenomenon is found to be caused by a vegetable production of the simplest kind, being but an immense crop of single cells without root, stem, leaf, or flower, yet impressed with the mysterious principle of vitality, and multiplying by constant divisions and subdivisions of the parent cells.

EDITORIAL JOTTINGS.

In a recent trip through Southern Illinois we made a few botanical notes, which we give our readers. The low bottom lands near the Ohio and Mississippi rivers are heavily timbered. One of the commonest trees is the American or White Elm (*Ulmus Americana*, L.) This has just passed the flowering stage. The Red Maple (*Acer rubrum*, L.) occurs frequently, and is also just out of flower. The Sweet Gum (*Liquidambar*) is abundant in many localities, a large number of the prickly fruit-balls still remain upon the tree. That vegetable thief, the Mistletoe (*Phoradendron flavescens*, Nutt.), seems to have a particular attachment to the Elm trees, occurring much more frequently on them than on any other tree. It grows also on the Sycamore (*Platanus occidentalis*, L.), on the Red Maple (*Acer rubrum*, L.), on the Black Gum (*Nyssa multiflora*, Wang.), and on some other trees. Some large Elms seemed loaded with this parasite, a hundred or more bunches growing upon one tree. These masses of yellowish-green vegetation give the trees a peculiar appearance.

In many cases the small branches of the Sweet Gum were covered with broad corky ridges; sometimes this occurred only on the lower limbs, and in other cases all the branches were free from the excrescence. These corky ridges are much like those which occur on the Winged Elm (*Ulmus alata*) which also grows in the same places.

On rocky ledges at Cobden we found old fronds of some interesting ferns, viz.: *Cheilanthes vestita*, Swartz, *Polypodium incanum*, Swartz, *Asplenium ebeneum*, Ait., and *Asplenium trichomanes*, L. Old stalks were also abundant of the False Aloe (*Agave Virginica*, L.) This plant sends up a large and pretentious stalk, but its flowers are insignificant. Patches of the small cane (*Arundinaria tacta*, Muhl.) were frequently visible, and at first sight might be mistaken for small willow bushes. The low and swampy grounds are everywhere becoming verdant with extensive patches of the Copper-colored Iris (*Iris cuprea*, Pursh).

Many other rare plants occur in this region, of which we shall probably have occasion to speak hereafter.

MANY plants could not be perpetuated but for the agency of insects, and especially of bees; and it is remarkable that it is chiefly those which require the aid of this intervention that have a nectarium and secrete honey.

NOTES FROM CORRESPONDENTS.

We have the following notes from Mr. E. Hall, of Menard county, Ills., and commend his inquiries and observations to the attention of our readers:

Ground Nut—(*Apios tuberosa*, Mœnch).—Will the readers of this journal everywhere, during the coming season, make observations on the fruiting of this vine, and will those who are so fortunate as to find it in fruit examine carefully and report the conditions under which they so find it? Its habit of reproducing itself from the tubers is the supposed cause of its general infertility; and when found in fruit the tubers should be carefully unearthed, and their development and health noted, as well as their connections with the plant. I have only once met with this plant in fruit in the State of Kansas, and where I had no opportunity to examine the development of its tubers. Its flowers are very fragrant, thus attracting insects that may destroy the fertilizing elements of the female organs by undue irritation, or by producing premature dissemination of the pollen; but, whatever the cause, careful and patient observation will detect it.

Quercus alba-macrocarpa.—A true hybrid, perfectly fertile, is growing near Athens, in Menard county, Ills. The mother tree was undoubtedly *Q. macrocarpa* of the variety called *olivæformis*, as young specimens, apparently of the same age as the hybrid of that species, are or were growing in its vicinity. In general character its paternal blood largely predominates, its maternal characters are chiefly notable in the fruit, the younger branches, and in the form and pubescence of its leaves. From these several characters its parentage is readily traced, and it affords a most interesting instance of a fertile hybrid of these two distinct species of oaks.

The genus Quercus in Menard County, Ills.—The species of this genus here have prevalence in about the following proportions:

White Oak (*Quercus alba*), 33 per cent.
Yellow and Scarlet Oaks (*Q. coccinea*), 25 per cent.
Red Oak (*Q. rubra*), 10 per cent.
Burr Oak (*Q. macrocarpa*), 10 per cent.
Chestnut Oak (*Q. castanea*), 8 per cent.
Post Oak (*Q. obtusiloba*), 5 per cent.
Laurel Oak (*Q. imbricaria*), 5 per cent.
Black Jack (*Q. nigra*), 3 per cent.
Pin Oak (*Q. palustris*), ½ per cent.
Swamp White Oak (*Q. prinos*, var.), ½ per cent.

I have placed the Yellow and Scarlet Oaks together from the fact that the species are not easily known or readily separated; even good botanists are often puzzled to discriminate between them, and some have doubted the existence of both species, but the weight of opinion is at present in their favor. Their specific differences are to be sought chiefly in what might be called constitutional characters. Eleven-eighteenths of the species of the Northern United States east of the Mississippi are represented in this locality—a much greater proportion than the general flora of the same region—showing that these kings of the forest have somewhat equal powers in competing for existence under the conditions here prevailing. Since the settlement of the county a new generation is springing up, which is somewhat differently proportioned. The above estimates are for the original forests.

From New York.—You ask for some botanical notes from this part of our great country. Vegetation is yet mostly dormant, and we must confine ourselves to anticipation of what Nature will soon present. Here and there, however, in warm sheltered spots, by brushing away the masses of fallen leaves we may recognize some of our early spring flowers nearly ready to burst forth into life and beauty. Among these is the Liver-leaf (*Hepatica*), the Spring Beauty (*Claytonia Caroliniana*), and several kinds of violets.

Of the violets I must speak a little at large, although it is yet too early for their appearance. The commonest, and perhaps the most beautiful, is a blue violet growing in wet or damp grounds, especially in meadows and by the borders of brooks and streams, the *Viola cucullata*, Ait., which rendered into English means the Hooded violet, from the manner in which the young leaves are rolled together in the form of a hood. The color of this violet is quite variable, from a light sky-blue to a dark purple, but always bright and attractive. Next we have, in low or wet grounds, the small White violet (*Viola blanda*, Willd.), with roundish, heart-shaped, or kidney-shaped leaves, and delicate white flowers on short stalks, seldom rising more than an inch or two from the ground. Then we have the low yellow violet (*Viola rotundifolia*. Mich.), which is found on wooded slopes and hill sides. This has small, bright yellow flowers, opening in early spring. The leaves, at the time of flowering, are about an inch broad and nearly round, but when fully grown they are often three or four inches across. The three species we have mentioned are stemless violets, the leaves and flowers springing separately from the root or root-stock.

Of the stemmed violets we have a number of species. In damp shady places the low leafy blue violet, a variety of *Viola canina*, L., or the *Viola Muhlenbergii*, Torr., the Long-spurred violet (*Viola rostrata*, Pursh.), in rich soils on wooded hills, the Striped-flowered violet (*Viola striata*, Ait.), and the large white violet (*Viola canadensis*, L.), which is the largest species we have in the country, common in rich, open woods, the flowers of good size, whitish, and delicately tinged with violet. Lastly, we have the large yellow violet (*Viola pubescens*, Ait.) which is common in open, and especially in sandy woods.

I was much pleased the other day, in crossing a low place in a meadow, to observe the young flower-stalks, or spathes, of the Skunk Cabbage (*Symplocarpus fœtidus*, Salisb.) just shooting into sight. With a knife I cut down into the ground, and severed some of these from the root, that I might examine their very singular structure. They consist of a roundish mass, or head, in which grow many small crowded yellowish flowers, the whole surrounded by a thick, leathery kind of leaf, of a purplish color, spotted and striped with yellow and green, and extending beyond the cob, or head of flowers, enwrapping and almost entirely concealing them from view. The young leaves are already beginning to press out of the ground, and when fully developed they form a mass of large heart-shaped leaves, looking not unlike a head of cabbage, and, from their strong and peculiar odor, meriting the name by which it is generally known. A plant of such offensive odor should have some compensating qualities, and we find that the root of this plant has a pretty well established reputation in the Materia Medica.

Meagre as is the botanizing field among the flowering plants at present, we find it little more satisfactory among cryptogams. Several kinds of mosses have found warmth sufficient to make some growth, and send up fruiting pedicels and mature capsules. On the bodies of trees are several species of *Orthotrichum* (particularly *O. strangulatum*, Beauv., and *O. crispum*, Hedw.) in little round patches, and occasionally large masses of the handsome *Neckera pennata*, Hedw. I often gather this in fine condition on the beech wood which is brought into market. Various other kinds of mosses are still under beds of snow, where they find conditions favorable to their growth, and when their fleecy covers are melted away they will please the eye with their bright and lively colors, and repay tenfold any labor taken in a close examination. These small delicate objects are worthy of more careful study. P.

UTICA, N. Y., April, 1870.

ANSWERS TO CORRESPONDENTS.

Plants to Name—*Mrs. B. S. Lake, Colorado.*—It is a pleasure to look upon such finely preserved specimens as the Colorado plants you send. No. 1 is the sky-blue Columbine (*Aquilegia cerulea*, Torr.), one of the finest ornaments of the Rocky Mountains. The flowers are larger and more showy than either the garden Columbine (*A. vulgaris*, L.) or the wild Columbine (*A. canadensis*, L.) of the Eastern States. It grows about two feet high, has large bright blue flowers, the spur of the petals being two inches long. It is well worthy of cultivation. No. 2 is the smooth Mountain Maple (*Acer glabrum*, Torr.) It is a small shrub, six to eight or ten feet high, with small smooth leaves, somewhat three-lobed and toothed, and producing an abundance of the winged fruit peculiar to the maples. No. 3 is *Oxytropis Lamberti*, Pursh., without any common name so far as we are aware. It belongs to the Pea Family (*Leguminosæ*). It is a low plant with perennial root, bearing all the leaves at the ground and sending up simple spikes of flowers, varying from light blue to purple, which are succeeded by upright cylindrical pods about an inch long. The plant is wide-spread over the plains and among the lower mountain ranges. No. 4 is a shrub peculiar to the Rocky Mountains, nearly related to the Hydrangea, and is botanically known as *Jamesia Americana*, T. and G., in honor of the discoverer, Dr. James, the Botanist of Long's Expedition in 1820. No. 5 is a plant well known in the Western States, occurring in hazel patches and the borders of prairies, and is sometimes called Shooting Star, sometimes Pride of the Prairie (*Dodecatheon Meadia*, L.) It is a unique and beautiful plant of the Primrose Family. We do not mean the *Evening Primrose* Family, but the *true* Primrose Family (*Primulaceæ*). The type of this family is the Primrose of Europe, of which genus we have but two species (both rare) in this country. The Dodecatheon has a number of large, oblong, smooth leaves at the surface of the ground, from which rises a long naked stem a foot or two in length, and surmounted at the top with an umbel of from five to twenty flowers, which are nodding when fully open, but in fruit are strictly erect. It has been somewhat introduced into cultivation, and is well worthy a place in every garden.

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Entomological Department.

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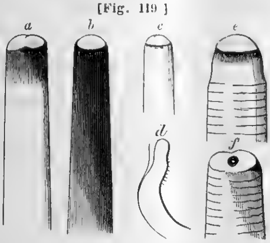
221 N. Main st., St. Louis, Mo.

THE GORDIUS, OR HAIR-WORM.

BY PROFESSOR JOSEPH LEIDY, PHILADELPHIA

[Fig. 119]



Though by no means common, most persons, at least those living in the country, are more or less familiar with the curious animal known under the various names of Hair-worm, Hair-snake, and Horse-hair worm. Usually a single specimen is observed at a time, sometimes in a rain puddle in a hollow or wagon-rut by the wayside, or in a drinking-trough at a village inn, attracting attention by its active and incessant wriggling movements, bending from side to side and curving in all directions, and giving rise to the impression that it is writhing with pain. Its resemblance in form and color to a horse hair, coupled with the position in which it is ordinarily noticed, has given rise to the world-wide popular belief that the creature is actually a transformed horse-hair—one that by maceration has become endowed with independent life, and the inherent power of movement. I once saw, in an old English periodical, an attempt at an explanation of the manner in which horse-hairs, in the process of decomposition, gave rise to movement, which induced me to try the experiment of making hair-worms. I need hardly say that I looked at my horse-hairs for many months without having had the opportunity of seeing their vivification.

The Hair-worm is, however, a distinct animal, having no further relationship with a horse-hair than in its general likeness, which is by no means an exact one. When sought for in the proper places, as is the case with many other animals, the Hair-worm is much less rare than is generally supposed. In the latter part of summer or the beginning of autumn, in the search for the animal, I have frequently found it, while sauntering along the banks of a river or creek, in little hollows close to the shore. It requires some practice to discover it, as usually it is comparatively quiet in such situations, and may readily be confounded with the blackened, decomposing vegetable fibres occupying similar places. Sometimes it is found single, and at others a number are discovered coiled together in a loose, but intricate-looking knotted mass. Such knots, which had passed through the water pipes and issued at hydrants in our city, I have seen on two occasions. Similar knots, no doubt, were the source of the scientific name of the worm, that of Gordius, applied to it by Linnæus, from the fabled Gordian-knot of antiquity. The Gordius, however, not only resembles the latter in the intricate condition into which it sometimes gets, but its history is yet in part a Gordian-knot to be unraveled.

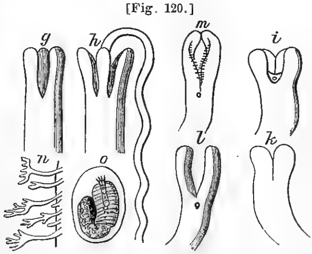
The worm is perhaps the hardest or most resistant to the feel of any of its Order, and it is tough and elastic. It is very tenacious of life, and when cut into several pieces will continue to live and move for some time afterwards.

Linnæus accepted a popular error in regard to the Gordius. In his *System of Nature* he says that, "if the worm is incautiously handled it will inflict a bite at the ends of the fingers, and occasion the complaint called a whitlow." It is sufficient to refute such a fancy when it is learned that the animal has neither jaws nor other instruments by which it could either bite or sting.

A number of species of the genus have been noticed in different parts of the world. Several European species have been described, and we have as many in this country which appear to be quite distinct from the former. The more common American species of the worm I have named the Variable Gordius (*G. varius*) from its presenting some variety of character.

The worm is cylindrical, of pretty uniform diameter, but slightly narrowed at the ends. It is smooth and lustrous, and varies from a light yellowish-brown to a chocolate-brown, sometimes nearly black. It is usually much coarser than a horse-hair, to which it is so commonly likened. The head end is marked by a ring of darker color (see Fig. 119, *a*) than the rest of the body. The ring appears darker in contrast with the lighter condition of the latter, and may be obscured entirely in the nearly black varieties (Fig. 119, *b*). The summit of the head appears as a convex whitish prominence included within the ring, and is composed of a thinner membrane than the rest of the integument.

[Fig. 120.]



The tail end of the male makes one or two spiral turns, and terminates in being forked. The tail end of the female is straight, and ends in three lobes (Fig. 120, *g h*). The male varies in length from 4 to 6½ inches, with the thickness from 1-5 to ¼ of a line. The female ranges in length from 5 inches to a foot, with the thickness from ¼ to ⅓ of a line.

The males of this, which I have regarded heretofore as of one species, present two varieties, each of which I now suspect to indicate a different species. In the one variety, usually more robust than the other, the forks of the tail are not longer than the thickness of the body—as seen in Figure 120, *k*, which represents a dorsal view. Between the base of the forks, on the ventral surface (Fig. 120, *i*), there is included a crescentic fold in which may be seen the genital pore. In the other—usually of more slender form—the forks of the tail are two or three times the length of the thickness of the body (Fig. 120, *l*), and the forks do not include at their base a crescentic fold as in the former. The genital pore is a little in advance of the division of the tail. The species, probably indicated in this last form, might be distinguished by the name of the Long-lobed Gordius (*G. longilobatus*).

A more delicate species than the former I have named the Linear Gordius (*G. lineatus*). It was indicated by half a dozen specimens obtained by Prof. S. F. Baird, from a spring in Essex county, New York. It is of a light clay-color, and has no dark ring encircling the head, which is represented in Figure 119, *c*. The tail end of the male (Fig. 120, *m*) is forked very much as in the Long-lobed Gordius, but the forks are furnished on their inner margin, ventrally, with a fringe of minute processes, such as are represented, highly magnified, in Figure 120, *n*. The tail end of the female is blunt and unprovided with lobes, the genital pore occupying the centre of the extremity, as seen in Figure 119, *f*, the similar end of a larger species, to be next described. The male measures from 5 to 7 inches in length, by 1-6th of a line in thickness. A single female accompanying the males was 5 inches long and 1-5th of a line thick.

Numerous specimens of a much larger species of Gordius than any of the preceding, were sent to me some years ago by Dr. Wm. A. Hammond, who obtained them 525 miles west of Fort Riley, Kansas. They were discovered in large numbers in a pond, in company with the curious batrachian Siredon, or so-called Fish-with-legs. They swam actively just beneath the surface of the water, and occasionally protruded the head above into the air. They are of a light yellowish-brown, with the head end encircled by a narrow band of darker hue, as represented in Figure 119, *e*. The males are darker than the females. The tail end of the former resembles that of the male of the Variable Gordius (Fig. 120, *i k*). The tail end of the female (Fig. 119, *f*) is blunt, and exhibits the genital pore in the centre surrounded by a brown ring. The body of this Gordius is more annulated than in any of the other species. The males measure from 8 inches to 2 feet 2 inches in length, and 1-4 to 2-5ths of a line thick. The females measure from 10 inches to 2 feet 6 inches in length, by ⅓d to 3-5ths of a line thick.

The species I think to be the same as one previously described by me, under the name of the Robust Gordius (*G. robustus*), from a female specimen, about 6 inches in length, which was found parasitic in a Grasshopper (*Orchelimum gracile*), in New Jersey. Certain it is, the latter agrees in all details with the female specimens from Kansas, except in size. The great Helminthologist, Dr. Diesing, of Vienna, from my description, named the species *Gordius subspiralis*.

Although the complete history of the Gordius remains unknown, it is nevertheless clearly established that it passes a great part of its existence as a parasite in various species of insects. I have never had the good fortune to observe any of our species actually within, or proceeding from, insects, though I have, in a multitude of instances, seen the allied genus, Mermis, or White Hair-worm, within insects. A single specimen, from which I first described the Robust Gordius, was sent to me, together with a Grasshopper (*Orchelimum gracile*), which was said to have contained the worm.

The common European species (*Gordius aquaticus*, etc.) have been frequently observed within and proceeding from insects, which are there viewed as their natural habitation for the time, as much so as is the water subsequently. The names of various Beetles, especially the Ground-beetles, and also Grasshoppers, are given, which are infested with Gordii.

I have observed a White Hair-worm (*Mermis*) proceeding from the Carolina Grasshopper (*Œdipoda carolina*, Linn.), whilst the latter was struggling in a ditch into which it had jumped from being alarmed. Perhaps in this way we may account for the occasional appearance of a Gordius in a drinking trough, or a puddle on the road.

A brief notice of the structure of the Gordius may not be uninteresting in connection with the history of the animal. Notwithstanding the simplicity of its outward form, its organization is of complex character, and certain of its peculiarities are of special interest to the physiologist.

Though the Gordius has had the reputation of being able to bite, I must confess that I have not been able to satisfy myself that the animal actually possesses a mouth. For jaws I suspect the forks of the tail of the male have been mistaken. Some European observers have failed to detect the mouth, though Dr. George Meissner, of Göttingen, a most accurate investigator, both describes and figures it. Sometimes, and indeed generally, I have detected the appearance of a minute orifice, or pore, to one side of the summit of the head in the Variable Gordius, but in other instances and in other species, including the large Robust Gordius of Kansas, I could distinguish nothing of the kind, the head end appearing as smooth as a watch crystal, without the slightest sign of even a depression.

All reliable investigations, in addition to my own examinations, prove the total absence of anything like a stomach, intestinal canal and vent in Gordius. The interior of the body is occupied by a soft, white matter, reminding one of the pith of sassafras or other plant. This matter consists of polyhedral cells, resembling vegetable cellular tissue, and forms a continuous mass from one end of the body to the other. Spaces included in this cellular tissue are occupied by the genital and other organs. According to Dr. Meissner, the mouth opens into a short gullet which expands upon the upper end of the mass of cellular tissue.

Nutritive liquid matter imbibed by the mouth, or the thin investment of the head end of the animal, it is evident, can only pass throughout the body of the latter by endosmosis from cell to cell of the interior cellular structure. The arrangement of the latter, and the transmission of nutritive liquid, reminds one of the organization and passage of liquids through the rootlets of a plant.

Nothing like a system of blood-vessels, or nutritive tubes, nor like the tracheal air-vessels of insects, can be detected in the structure of the worm.

Whilst parasitic in insects, the Gordius is bathed in a rich and highly aerated nutritive material, and would thus not appear to require either an apparatus for the ingestion of food nor one for respiration. Perhaps, too, on account of the absence of a digestive and respiratory apparatus, when the Gordius first escapes from its abundant provision of "aerated bread," it is stimulated to incessant activity in the water to fulfill at least its respiratory need.

The generative apparatus of the female consists of a pair of ovaries, contained in the interior cellular tissue of the body, extending the greater part of the length of the latter on each side, and conjoining in a common receptacle below, which terminates at the genital pore. In the male the testes hold a similar relationship, and terminate in like manner.

Of other interior organs, there is a tubular gland extending through the axis of the body, and a cylindrical cord, apparently muscular, extending along the ventral side.

The nervous system consists mainly of a cord, without distinct or separate ganglia, extending along the ventral side, between the muscular cord just indicated and the general envelope of the body. In the head the nervous cord divides on each side of the muscular cord, and, according to Dr. Meissner, becomes continuous with a ring surrounding the gullet. No eyes or other organs of special sense appear to exist.

The external integument of the body consists of a thin cuticle of pavement-like cells, and a thick dermis. This is composed of layers of fibres which pursue a spiral direction around the body of the worm, alternating or crossing in the successive layers. Within the thick skin of the worm there is a thicker muscular layer, composed of longitudinal fibres.

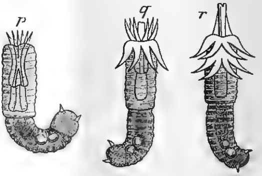
The Gordius is a wonderfully prolific animal. The mode of impregnation I have not observed. In the European *Gordius aquaticus*, Dr. Meissner observed that the tail end of the male wound spirally around that of the female, and by its forked extremity grasped that of the latter, while the genital pores were closely applied together.

The Variable Gordius and the Long-lobed Gordius extrude their eggs in a long, narrow white cord, from between the lobes of the tail, as represented in Figure 120, *h*. I observed a Variable Gordius, 9 inches in length by 2-5ths of a line in thickness, commence laying eggs, and continue the process very slowly and gradually during two weeks. They were extruded in a delicate cylindrical cord, resembling a thread of sewing cotton. At first it broke off, as extruded, in pieces about a foot in length, but, towards the end of the process, the cord appeared to be less tenacious, and broke off in pieces a few inches, and even a few lines, in length. The pieces in the aggregate measured 91 inches; the thickness of the cord was about the 1-10th of a line. The eggs are very minute, and in the cord were compressed together so as to be polyhedral. In a transverse section of the cord I counted about 70 eggs, and in the length of 1-40th of an inch 26 eggs, which by calculation gives 6,624,800 as the whole number of eggs in the cord. The eggs when isolated assume an oval shape, and measure about the 1-750th of an inch long by the 1-1000th of an inch broad.

The development of the young from the egg is readily observed from day to day; and it takes about a month before the process is completed. The globular mass of yolk in the centre of the egg undergoes segmentation, and increases in bulk until it is finally resolved into an oval mass of granules occupying the greater part of the interior of the egg. Gradually the mass assumes the appearance of a worm doubled upon itself, as seen in the magnified view (Fig. 120, *o*). In about four weeks the Gordius reaches maturity, and escapes from the egg totally different in appearance from the parent (Fig. 121, *p q r*).

The newly developed Gordius is about the 1-450th of an inch long. The body is constricted just posterior to the middle, so as to appear divided into two portions, reminding one of the two divisions of the body in spiders. The anterior thicker portion of the body is cylindrical, distinctly annulated, and contains a complex apparatus which the animal is capable of protruding and withdrawing. The posterior part of the body is cylindrical, annulated, and rounded at the extremity, which is furnished with a pair of minute hooks. The interior exhibits a faintly granular structure, including two large, clear, globular bodies.

[Fig. 121.]



The young Gordius appears not to be able to swim about, but lies at the bottom of the vessel containing it, slowly progressing through the alternate protrusion, reflection and retraction of the oral apparatus, and occasionally swinging the hinder part of the body from side to side.

The oral apparatus consists of a collar, with two circles of hooks, six in each, and a proboscis-like style. In the movements of this apparatus, the ends of six hooks are seen to protrude from the centre of the head (Fig. 121, *p*). These continue to project and diverge more and more, and then become reflected. As they turn backward the ends of the second circle of hooks are observed protruding in the same manner, and then follows the style (Fig. 121, *q*). When the latter is fully protruded, the first circle of hooks is seen at the margin of a collar deeply reflected at the side of the body, while the second circle of hooks is reflected from the margin of the head (Fig. 121, *r*). In a reverse order the different parts of the apparatus are retracted, to be again protruded in the manner described.

The newly developed Gordii, under my observation, continued to live about a week more, and then gradually died.

Dr. Meissner was successful in following the history of the animal a step further. Having placed in the same vessel with the young Gordii a number of larvæ of May-flies (*Ephemeridæ*), and Caddice-flies (*Phryganeidæ*), he observed that they entered these insects, and thus commenced their parasitic life. The worms were observed to penetrate the delicate membrane at the joints of the legs of the insects, and gradually to advance among the muscles and other organs throughout the body. In some of the insects as many as forty of the young Gordii had penetrated. They afterwards became quiescent, doubled on themselves, and encysted, so as to resemble their former condition just before emerging from the egg. In this state they recall to mind the similar encysted Trichinæ in the muscles of man and the hog.

Dr. Meissner observed no further change in the Gordii, while contained in the insect larvæ, nor did he detect them after feeding some of the latter to water Beetles.

Thus from the young Gordius, which has escaped from the egg and entered upon its parasitic life in the interior of insect larvæ, to the parent Gordius, as it is commonly observed, either as a parasite or living in the water, the circle of the animal's history is broken and unknown.

Perhaps the young Gordii remain quiescent in the May and Caddice-flies until these undergo their last transformation in the air, when they may be seized and devoured by Ground-beetles, which are ever lurking beneath stones and other objects in the vicinity of water, on the lookout for prey. Once eaten by the Beetles, like Trichinæ swallowed by the hog, the Gordii may then undergo transformation, and assume the form of the parent Gordius, which is said especially to infest the Ground-beetles.

EXPLANATION OF FIGURES, ALL OF WHICH ARE MAGNIFIED.

FIG. 119 —*a*. anterior extremity of the female Variable Gordius (*G. varius*); *b*, the same of the male; *c*, anterior extremity of the Linear Gordius (*G linearis*); *d*, side view of the posterior extremity of the male of the same species; *e*, anterior extremity of the Robust Gordius (*G. robustus*), from Kansas; *f*, posterior extremity of the female of the same species, exhibiting the genital pore.

FIG. 120.—*g*, Posterior, tri-lobed extremity of the female Variable Gordius; *h*, the same, with the lobes more divergent, and exhibiting the extrusion of the cord of eggs; *i*, posterior bi-lobed extremity of the male Variable Gordius, seen on the ventral surface, and exhibiting the genital pore; *k*, dorsal view of the same; *l*, posterior bi-lobed extremity of the male Long-lobed Gordius, seen on the ventral surface, and exhibiting the genital pore; *m*, the same in the male of the Linear Gordius; *n*, portion of the fringe of the latter, highly magnified; *o*, egg of the Variable Gordius, containing a fully developed worm, highly magnified.

FIG. 121 —The young Variable Gordius, after escaping from the egg, highly magnified; *p*, the worm commencing to protrude the oral apparatus; *q*, the first circle of hooklets bordering the collar reflected, and the protrusion of the second circle of hooklets and the style; *r*, complete protrusion of both circles of the hooklets and style.

ONE DAY'S JOURNAL OF A STATE ENTOMOLOGIST.

[This is one of Mr. Walsh's posthumous papers. The duties therein defined may be considered light, as will readily be imagined, when the number of letters received each day swells to fifteen or twenty, instead of six or seven, as we often find to be the case during the height of the summer season.—ED.]

Many persons have an idea that the office of State Entomologist is a snug little sinecure, such as the footman was in search of when he told the gentleman who proposed to hire him that he wanted a place where the wages were high, and where there was very little work to be done, except kissing the housemaid. We propose, for the enlightenment of persons like these, to give, in the following paragraphs, a sketch of an average day's work, such as the Bugmaster General of Illinois, or the State Entomologist of Missouri, has to perform almost every day during the greater part of the year.

5 A. M.—Rose and went over to the office. Examined my breeding-cages; found the leaves beginning to wilt in five of them, in two of which I had larvæ feeding on oak leaves, while the larvæ in the remaining three lived respectively upon hickory, plum and basswood. Took my cane and hat, and started out to get a supply of fresh leaves. Had to walk a distance of a mile and a half, because there was no basswood growing any nearer to my office. Returned and shifted the larvæ on to fresh twigs, placed, as usual, in water to keep them fresh as long as possible. Noted in my journal how many larvæ in each cage had gone to pupa, and how many had died or disappeared from other causes.

7 A. M.—After breakfast, and while I was smoking my usual cigar, examined my breeding-jars, and the cages where I keep my pupæ. Found that seven moths had come out. Noted in my journal the lot of pupæ from which each of the seven had come out, so as to connect each separate species with its larval history. Killed the moths, and set out their wings in my drying-box. Before I could do this—as all the trays in the drying-box were brimming full—had to remove the setting-pins and setting-braces from a whole tray, and distribute the dried insects among the appropriate store-boxes, each group in a separate store-box along with the labels that belong to each species, and indicate its name and history as far as ascertained. Found that, in my breeding-vases, I had reared three species of insects that were quite new to me. Ascertained at once the name of two of them; but, after spending two hours in referring to a dozen different authors, to find out the name of the third, am more in the dark than ever. Surely this must be a new and hitherto undescribed species. If so—but I must see about that to-night.

11 A. M.—Run up to the post-office for my morning mail. Find there four letters from correspondents, enclosing specimens of bugs, and requesting an immediate answer, two such letters to be answered through the ENTOMOLOGIST, and a package of proof-sheets from R. P. Studley & Co., St. Louis; also, a lot of political

and agricultural journals. Return home in a hurry, pitch the printed journals into the basket, to be examined when I have a little leisure, and answer per mail the four letters that require immediate attention. Luckily the insects sent with these four letters are all common species, and perfectly familiar to me; and, as I know them "like a book," it does not take me long to write my four letters.

12:30 P. M.—After dinner, and while I am luxuriating in a fragrant Havana, revise the proof-sheets. Find but very little indeed to correct. Have had proof-sheets from a dozen different printing offices in America, and from twice that number in England, and never yet met with such "clean" proofs as Messrs. Studley & Co. turn out from their magnificent establishment. Open the two letters, enclosing specimens of bugs, and requiring to be answered in the ENTOMOLOGIST. One of them is all plain sailing, as the insects are well known to me, and are properly packed with some cotton wool in a little stout pasteboard box. The other correspondent has enclosed his specimens loose in his letter, and being soft, fleshy larvæ they are squashed into a most promiscuous mass. Puzzle a long time over the head, which is the only recognizable part. Conclude that it probably belongs to some one or other out of fifteen distinct larvæ. Puzzle again for half an hour longer to *guess* which larva of the fifteen is the one that has been sent me. Alas! I am no Yankee, and have finally to give the job up in despair. Write the appropriate "Answers to Correspondents," and fully expect to be "cussed" considerably by one of them, because I cannot distinguish every one of the thirty thousand species of insects that exist in the United States by a fragmentary specimen of its head.

4 P. M.—Go into my garden to examine the results of several experiments that I am trying as to the efficacy of different chemical preparations upon several different noxious insects. Return and record the results, so far as they appear up to this day, in my journal. Walk out with my fly-net, and capture two males and one female of a rare insect, which is comparatively common here, and of which I have promised to send specimens to an Eastern correspondent, in return for his kind assistance in making extracts for my use from scarce and expensive Entomological works, which at present are only to be found in the great scientific libraries in the Eastern cities. Heigho! I wonder if we shall ever get a public library in the West that is decently supplied with standard works on Natural History. I wish I was a rich man; would not I then send an order forthwith to Europe for $10,000 worth of Entomological books!

6:30 P. M.—Have just returned from the post-office and swallowed my supper. I have received two more letters on the great Bug question, that require immediate attention; and a long and most interesting letter from an entomological correspondent in Europe. Run my eye over the last, and find my modesty terribly shocked by his telling me that the ENTOMOLOGIST is highly appreciated among scientific men on the other side of the Atlantic. Answer the other two letters, one of which contains some new and most important facts about a certain noxious insect, which throw great light upon a point in its history that has hitherto been wrapped in obscurity. What an accurate observer that last correspondent of mine is! I would just as soon trust his eyes—as to the operations of any particular bug—as I would my own! But then, of course, I know the correct names of the different bugs better than he does. If I had but one hundred such correspondents, they would be as useful to me in my scientific investigations as fifty pairs of additional eyes! And yet this man is nothing but an intelligent fruit-grower, with good, strong common sense, and that most invaluable habit of never seeing anything until he does actually see it.

8 P. M.—Having now discharged the duties of the day, I am just about to sit down to prosecute some further investigations into the correct name and classification of that bug that bothered me so much in the morning, when I hear a tremendous fluttering in one of my breeding-cages. Lo and behold! There are two large moths come out that I did not expect to make their appearance for a week or two. Chloroform them to stop their fluttering; and, after killing them and stuffing their abdomens with cotton, set out their wings on the little space that remains in the tray that I cleared in the morning. To-morrow, I suppose, I shall be obliged to clear another tray. Well—"Sufficient unto the day is the labor thereof."

9 P. M.—Set to work once more to puzzle over my supposed new species. Can find no description to suit it in any work that I possess. Can it be really a new species? As usually happens in such cases, there are several species belonging to the genus, the descriptions of which are only to be met with in certain rare and expensive works which I am not rich enough to buy. What shall I do? I have it! I will enclose some specimens, so securely packed that they can not possibly come to any harm, in a letter to one of

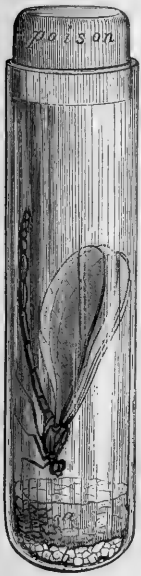
my correspondents in the East, who has the happiness to have access to the very best scientific library in the whole country. At my request he will, I know, compare the specimens sent with the descriptions to which he has free access every day, while I should have to travel a thousand miles to get to them. I do this; and now, having done my best, I will calmly and peacefully await results. But by this time it is 10 P. M., and I am beginning to feel sleepy and tired. Suppose I adjourn to the county of Bedford?

HOW TO COLLECT AND STUDY INSECTS—No. 2.

BY F. G. SANBORN, BOSTON, MASS.

One can scarcely walk a mile in the country without obtaining some object to grace his cabinet, or observing some fact in natural history to add to his store-house of mental treasures. It should be borne in mind by the student collector that, notwithstanding he may propose to confine his studies to one Order of insects, he should also contract a habit of observing and collecting those of other Orders, as well as such small and portable vertebrates and other invertebrates as his opportunities may enable him to capture and preserve. Alcoholic specimens of Mammals, Birds, Fishes, Reptiles, Mollusks, Crustacea, and facts concerning them, are marketable commodities in the Exchanges of Science. Especially should this plan be carried out by the collector who may be established for a term of months or years in a region remote from libraries and museums. Such study and investigation in this field as his time permits, will of itself materially enlighten his mind upon the secrets of Nature; and, although destitute of books—those records of repeated failures and few successful attempts to unmask Nature's protean face—he may learn the structure, habits and comparative intelligence of the creatures around him. A subsequent opportunity may occur for him to ascertain, if so disposed, the different technical names imposed upon "Mouse No. 7," "Bird and nest, XII," or "Bug No. 427," and accepted by the scientific world.

[Fig. 122.]



Should he care only to acquaint himself with the nomenclature of some limited group or order, and wish to increase his cabinet in that specialty, he will find that he has the powers of a capitalist to invest his miscellaneous collection of specimens and facts in such manner as he may prefer. Thanks to the diversity of tastes implanted in us, there is always some eager specialist—individual, or backed by an association—standing ready to give full value for, and "work up," this or that portion of such material.

The practice of noting (with *ink* if possible) in a small blank book, or on cards, such facts and observations as he may make or discover, adds immensely to the value of any collection, and can not be too strongly recommended to the collector. The date of capture of a specimen, of the transformation from the egg, larva or pupa, of the appearance or disappearance from its usual haunts, and such other items of interest that arise in connection with the specimen, are of importance to the student, and should be therein set down. A small tag or ticket of paper attached to the dry specimen, or of parchment, leather, or soft metal to the alcoholic, and bearing a number corresponding to that in the note-book, renders the information thus obtained available, and sufficiently identifies the specimen. As the collector pursues his investigations month after month, he will find his senses becoming educated to a delicacy of touch and fineness of perception that can not fail to be a source of pride and gratification to him. He whose attention would not at first be diverted to the ragged leaves of a caterpillar-ridden tree, will in a few months notice instantly the slight convexity of outline on twig or leaf caused by the presence of a small insect, or the extremity of a branch cleanly cut by a Pruner-beetle.

In the course of his observations he will be amused by the imitative shapes and colors of many forms of insect life, and will frequently be deceived by the Curculios, who successfully simulate buds and bits of bark. The caterpillars of some of the moths resemble so closely cylindrical twigs, as many of the Loopers (*Geometridæ*); scales of rough or smooth bark, as the Hag-moth (*Limacodes pithecium*), and the Lappet-moths (*Gastropacha velleda* and *americana*). Some of the Beetles, as the *Cryptocephali* and *Histers*, closely resemble seeds, as do certain Bugs, among them *Corimelaena*, and the two latter suggest such kinship as to cause them almost invariably to fraternize in the cabinet of the amateur. These singular resemblances are called mimetic forms; and, existing everywhere in Nature, even if they have no high significance and serve no better purpose, educate our perceptive powers to a degree undreamed of by the careless horde of money worshippers.

During the active season of the insect year the collector should make it a rule never to stir abroad without a cork-stoppered vial half filled with alcohol, for the temporary deposit of beetles, ants, or the larvæ or pupæ of any insects that it may be desirable to preserve in this way. The only insects that are irrecoverably injured by a few days immersion in pure alcohol are the Butterflies and Moths. For these a small cork or pith-lined pocket box, of convenient form and full one inch and a half in depth, containing a few insect pins of various sizes, is indispensable, and should be a constant companion. Upon a premeditated excursion of a day or more in duration, the collector will naturally provide more extensive means of transportation, such as jars of alcohol, a vial of chloroform, a number of old envelopes, and a larger box slung on the side with straps, and a proportionate stock of pins. Some collectors continually carry, in a pocket made for the purpose, a wide-mouthed vial like a chemist's test-tube, "of the same size all the way up," containing at the bottom a few grains of cyanide of potassium, which is kept in place by a wad of cotton, felt or thick cloth, neatly pressed down upon it. (See Fig. 122.) This prevents the cyanide, which is a deadly poison, from touching or soiling any delicate insect, and allows the powerful vapor to destroy, as it does almost instantly, the life of any insect that may be enclosed in the prepared vial. The permanence of this poison (its virtue enduring for a twelvemonth or more), its cleanliness and cheapness, render it perhaps the most convenient and desirable "life-annihilator." It is, perhaps, unnecessary to mention that the vial should be kept tightly corked, and that the insect should remain therein not much more or less than ten minutes. A vial one inch in diameter and four in length, made of strong glass, is the most desirable size. Some collectors carry a small vial of chloroform, through the cork of which passes a very small tube of metal; what is called by jewellers "hollow wire," of minute aperture, is used for this purpose. (See Fig. 123.) This instrument is used for conveying a limited quantity of chloroform to the spiracles of the insect, without deluging and damaging much of its plumage, if furnished therewith. Ether, as well as chloroform, is sometimes used in lieu of the cyanide, but it has to be continually supplied from another reservoir. In some countries bruised laurel leaves are placed in the bottom of the vial, or a small packet of them pinned in a corner of the collecting-box, enclosed in a little bag or wisp of loosely woven cloth, such as lace, book-muslin, &c. All of these poisons act at first only as anæsthetics, or stupefiers, and should be continued in use sufficiently long to destroy vitality, or to prevent the struggles of the insect; for by these struggles it injures itself, as well as its companions, after being pinned in the collecting box.

[Fig. 123.]

NOTES AND EXPERIMENTS ON CURRANT WORMS.

BY W. SAUNDERS, LONDON, ONT.

The larva of *Nematus ventricosus*, alas, too well known under the popular designation of "currant worm," has been very abundant in this neighborhood during the present season. In my own garden it has been a continual fight as to who should have the currant and gooseberry bushes, the worms or their rightful owner. During the early part of summer, anticipating their attack, I was on the lookout for them and by timely doses of hellebore preserved the foliage with but little damage. In about a fortnight later, having omitted inspection for a few days, I was surprised to find the bushes being stripped again; and this time the enemy had got so far ahead as to damage their appearance considerably. Another prompt dosing of hellebore brought relief. After this I hardly ever found all the bushes entirely free from them; a walk around the garden would reveal a few here and a few there, and I was perpetually hand-killing and brushing off these smaller detachments. Four times during the season I found it necessary to apply hellebore freely, for the foes were a legion.

During the middle of August, being occupied with other matters, the garden was neglected for a few days, when on visiting it again on the 19th, I found many of the bushes entirely leafless, and the foliage remaining on the others was rapidly disappearing. I felt discouraged and began to have some misgiving as to whether hellebore was after all such an unfailing panacea for this almost universal pest as we had supposed. I resolved if possible to satisfy myself fully on this point, and having mixed about 1½ oz. of powdered hellebore with a pail of water, was ready to proceed. I selected a leaf from two bushes, marked them and counted the number of their inhabitants—one was occupied by *forty-four* worms of different sizes, crowding it above and below, and it was about half eaten; the other leaf had twelve nearly full grown on it. Having transferred the mixture of hellebore and water to a watering pot, the bushes were sprinkled with it. I returned to examine the results in three-quarters of an hour, and the leaf which at first had forty-four on it, had now only two, and these were so far exhausted that they were unable to eat, and could hardly crawl, while on the other leaf out of the twelve there remained three, but in the same enfeebled condition. All around under the bushes, the ground was strewed with the fallen foe, and I felt perfectly satisfied that entire reliance might be placed on this means of defense.

I did not anticipate such speedy action on the part of the hellebore, or should have returned to the examination sooner, and the bushes were so entirely cleared, that excepting on one I had reserved for another experiment, I had no means of repeating the dose.

There was one thing that struck me as somewhat remarkable, the portion of leaf on which the greatest number were feeding, appeared to be of the same size as before the hellebore was applied; if smaller I could not perceive it. When the leaves dry, which have been sprinkled with liquid, a very thin coating of the powder, more or less regular, is found over them, and I had always supposed that death resulted from eating a portion of the leaf thus coated. Such is undoubtedly the case when the hellebore is applied dry, but in this case a meal however small made by *forty-four caterpillars* on half a leaf, must have materially diminished it. I am disposed to believe then that the death of most of these must have resulted from their imbibing or absorbing some of the liquid as soon as applied. Many of them showed symptoms of the violent cathartic action of the remedy, having a mass of soft excrement hanging to the extremity of their dead bodies.

I had reserved one bush, on which were a good number, for another experiment. It sometimes happens, especially with those who live in the country, that hellebore is not at hand when the worms are first observed at work, and a few days' delay in procuring it is perhaps unavoidable. In such cases the bushes may be entirely leafless, before the remedy can be applied. Hot water suggested itself to my mind as likely to be of some service, and being also an article readily procurable in every home. It is well known that many plants will bear such an application without injury, provided the heat is not too great. Taking some in a watering pot, a little hotter than one could bear the hand in, I showered it plentifully on the affected bush, and it was amusing to see how the caterpillars wriggled and twisted and quickly letting go their hold, fell to the ground, which was soon strewed with them. After the first excitement produced by the sudden heat was over, they remained as if wishing to "cool off" before commencing work again. A few did not recover from the application, but most of them were soon as active as ever.

Now what I would suggest is this, that where the hellebore cannot be at once procured, no time should be lost in applying the hot water, and when once on the ground the creatures may have the life trodden out of them by the foot, or beaten out with the spade or some other implement. In any case many of them would never reach the bush again, for enemies beset them on every side. I was amused to see how busy a colony of ants were which had a home at the base of a tree near by, lugging these large caterpillars along, a single one of which would take three or four to manage. The worms were twisting and jumping about as if they wondered whose hands they had got into, and the ants were hanging on with their sharp jaws and slowly dragging the bodies along. By and by they had quite a little pile accumulated, which would no doubt furnish them or their progeny with a feast of fat things for some time to come. Then there are the tiger beetles (*Cicindelidæ*), with a host of others ever running about, looking for stray objects of this sort on which to make a dainty meal.

I had observed on one of the bushes, before applying the hellebore, some friends at work on these worms. They were immature specimens of a true bug belonging to the order *Hemiptera*, and probably the young of *Stiretus fimbriatus*. These creatures are nearly round, about the size of a common ladybird, having the head, thorax and legs black, and the abdomen red with an elongated black spot in the center, divided across by a whitish line. Approaching a caterpillar, they thrust their proboscis into it and quietly suck its juices until it becomes so weak and exhausted that it shrivels up and dies. With the view of testing the probable amount of good these friends were thus capable of accomplishing, I shut up two of them in a small box, with a dozen nearly full grown caterpillars, and at the end of three days found that they had consumed them all; also six in another box with one bug, and in this instance the rate of consumption was about the same, two caterpillars a day for each of these little creatures. The second time I fed them they did not get though their work quite so quickly; possibly they may have overfed themselves at first.

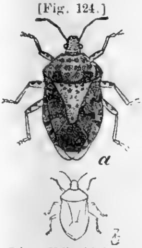
While turning up the branches of some of my gooseberry bushes, I observed a number of whitish eggs on some of the leaves, arranged lengthwise in regular rows at short distances apart, on the principal veins or ribs of the leaf. Usually they were placed singly in the rows, but here and there double. These were the eggs of the currant worm, they were about one twentieth of an inch long, four times as long as broad, rounded at each end with a whitish glossy surface. On the branch I was examining there were three leaves with these eggs on; two of them had their principal veins pretty well covered, while the third had but a few on it, as if this had been the work of a single insect which had exhausted her stock before the third leaf was covered. I counted these, and found there were 101 in all. Having just then caught one of the parent flies, a female which was hovering about as if looking for a place on which to deposit her eggs, I squeezed some eggs out of her body and comparing them with those on the leaf, found they were only about half the size, showing that the first must have grown considerably after being laid and that they were probably nearly ready to hatch. In about three hours afterwards, I observed that several of the young larvæ had come out of the eggs, and placing the leaf under a microscope had the good fortune to see some of them escape. The egg consisted of a thin elastic membrane sufficiently transparent to give a dim view of the enclosed larva. The black spot which is placed on each side of the head in this species, enabled me to determine the position the creature occupied. It was somewhat coiled up and resting on its side with its jaws against the side of the egg not far from its extremity. I could not perceive that it had any other means of rupturing the egg than by its mandibles, which were working visibly within. In a short time the egg was ruptured and the head of the larva protruded from the orifice. Withdrawing its two front feet from the egg, it seized the leaf on which it was placed, and by raising up its back and working itself from side to side, it soon worked itself out. The time occupied in thus extracting itself, from the first appearance of the head, varied from six to ten minutes, for I watched several of them through the process. The egg was so thin and elastic that it yielded readily to the motions of the body, and adhered very closely to it, contracting and shrivelling up as the body was withdrawn.

After the larva comes out it does not consume the egg or any portion of it, as is the case with most *Lepidoptera*, but sets to work at once eating the leaf on which its considerate mother placed it. When just hatched the worms are about one-twelfth of an inch long; head large, dull whitish with a round dark spot on each side, and a few minute short hairs; mandibles pale brown. Body above and below whitish, semi-transparent, sometimes with a slight greenish tinge. From this time it rapidly increases in size, becoming green then changing to green with many black dots, and finally reverting to pale green again, tinged with yellow at the extremities, just before it becomes a chrysalis.

I have a fact to communicate regarding the winter history of this insect. It has been universally held, that the larvæ, when they leave the bushes in the fall, at once construct their cocoons, either at the surface of the ground or just below the surface, and change to pupæ either then or sometime before early spring. Possibly as a rule this may be the case, if so I have an interesting exception to record. On the 22nd of May I was trying some experiments in crossing gooseberries, fertilizing the flowers of the Houghton's Seedling with some of the large English varieties, and having operated on several branches, tied them up in new paper bags to prevent interference with the work, either from insects or otherwise. The particular bag I am about to refer to, was attached to an upright branch on the summit of the bush, about eighteen inches from the ground. While examining it on May 31st, nine days afterwards, to ascertain the result of my work, I found in one of the folds of the bag a cocoon of *Nemantus ventricosus* firmly attached to the paper. In this instance the larva must have remained unchanged during the winter, then crawled from the ground, attaching itself as related and constructing its cocoon after the 22d of May. A few days later, I found a similar cocoon attached to the bush, which from its fresh appearance I inferred had been constructed about the same time, although I am unable to advance any positive statement regarding it. During the summer I have found a considerable number of such cocoons fastened to the underside of the leaves of the bushes on which the larvæ have been feeding, and these have been observed in all positions from near the base to the summit of the bushes, showing that it is not the invariable practice of the larva to undergo its change to chrysalis, either at the surface or under the surface of the ground.

[We copy the above interesting observations from the *Canadian Entomologist*, as an addition to the article published in the first number of our present volume. The Half-winged Bug spoken of on page 201, which so savagely attacks the Saw-fly larvæ, has never yet been described. We paid Mr. Saunders a visit, at the time these Bugs were in the larva state, and have since received two specimens of the perfect insect. From these, we are enabled to publish the following description through the kindness of Mr. P. R. Uhler, of Baltimore, who has sent us an advance copy from a paper which is now going through the press of the Smithsonian Institution at Washington. Our Figure 124, *a* giving a magnified view, and *b* showing the natural size, will enable the practical reader to recognize this friend, and if he should ever notice it upon his worm-infested currant or gooseberry bushes, let him carefully pick it off temporarily, and after the leaf-eating worms have been subjected to a shower of hellebore-water, or a blast of the dry and powdered article, let him tenderly replace it upon the bush, that it may slay the last one, of the injurious army, which may have escaped the avenging storm.—Ed.]

[Fig. 124.]



Colors—Yellowish-brown and dark-brown.

Podisus placidus, Uhler.—Ovate, luteus. Head truncated in front, the lateral margins slightly sinuate, black, recurved; each side of tylus a blackish, or brown, streak; a similar streak runs from behind each of the ocelli and curves towards the eyes, and sometimes coalesces with that on the tylus; the surface coarsely, remotely punctured; ocelli red; tylus smooth and cylindrical to near the tip, the tip depressed. Antennæ yellow, tinged with rufous, the middle, almost to each end, of all the joints infuscated above; basal joint not reaching the tip of the head; second joint subequal to the third and fourth united; remaining joints much stouter than the second; fourth and fifth subequal. Rostrum reaching to the venter; the basal joint shorter than the head. Pronotum short, the surface anteriorly rugose, coarsely, in patches aggregately, punctured with purple; the posterior division more or less suffused with purple; each side of callosities with a black dot; middle line smooth, yellow: humeral angles prominent, blunt, the lateral margins smooth, yellow, anteriorily obsoletely serrated. Underside and legs yellow; a series of small black dots extends from behind the eyes to the penultimate ventral segment; tips of tibiae, and tarsi, more or less infuscated or suffused with rufous. Scutellum clouded with purple, the middle line and tip remotely punctured, more distinctly yellow; the base with a few bare dots, the surface generally closely punctured. Hemelytra purplish, closely, more finely punctured, the exterior margin and principal suture yellow; membrane embrowned. Length 10 millims. Humeral breadth 5¼ millims. Inhabits Canada, Washington Territory, and Massachusetts.

To our Subscribers in Canada.—Parties in Canada, who wish to subscribe for the American Entomologist, can obtain it, postage free, by remitting $2.00 to the Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.

MY RASPBERRY AND VERBENA MOTHS, AND WHAT CAME OF THEM.

[Fig. 125.]

Colors—(*a* and *b*) yellowish-gray; (*c* and *d*) verdigris-green.

Readers of the American Entomologist, listen to my story, and give me your sympathies. Upon two occasions I have bred two beautiful little moths. One I called the Raspberry Moth, as the little caterpillars fed upon the leaves and fruit of the Raspberry; the other I called my Verbena Moth, as the larva fed upon the buds and flowers of the Verbena.

I hunted through all the works on Entomology I had access to, and could find no description of these moths; and I began to flatter myself that I really had found two new species. So I studied them carefully, took notes of all their wonderful ways, and spent much valuable time in watching their proceedings.

I found my little raspberry caterpillars had a decided preference for the Philadelphia Raspberry, though I occasionally found them upon the Black-caps. They also seemed to have a great passion for ornaments, for they had stuck all over their bodies dried anthers of flowers and small bits of sticks and leaves, which gave them a very comical and grotesque appearance.

I confined several of these larvæ in a box, giving them daily a fresh supply of raspberries, and they semed to thrive as well in confinement as in the open air. Knowing their fondness for ornaments, I could not deprive them of these; so I cut white paper and thread, together with leaves, into small bits, and distributed them in the box. Very soon they were decked out in these, the white paper and thread adding materially to their grotesque appearance. Not always satisfied with their own accumulations, they would sometimes take the ornaments from their neighbors and appropriate to their own use.

I once left the cover to the box not quite secure, and one of them made its escape, completely stripped of its ornaments; it had left all in the box behind, in squeezing through the aperture. I no sooner returned it to the box than it began to take the ornaments from its comrades to re-adorn itself, rather than to pick up its own, a process which those that were being stolen from did not seem at all to relish.

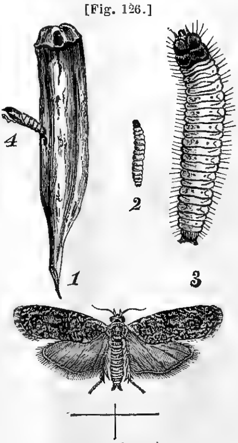
After they ceased eating and were ready to become pupæ, they spun loose cocoons, which they fastened to the top and sides of the box, taking their ornaments to decorate their cocoons, which, in consequence, wore a very rough, uneven appearance. In a few days, a little pea-green moth issued from these rough cocoons—the most delicate, beautiful little creature imaginable.

I now submitted it to the late Mr. Walsh, and received this reply: "Your Raspberry Moth is *Aplodes rubivora* of the Junior Editor, first described in his Missouri Report."

Down went all my air-castles of being immortalized in science with this delicate little creature!

I now had the Verbena Moth (Fig. 126, 5) to build my hopes upon. Although not so interesting as the other, still it was very pretty; and as my interest in the Raspberry Moth had greatly subsided, since I found that it had a name, and more than a "local habitation," so my regard for the Verbena Moth as greatly increased, notwithstanding it was such a terrible nuisance in the larva state. It seemed determined not to let us have a perfect verbena blossom.

[Fig. 126.]



Colors—(2 and 3) dirty flesh-color, inclining to green; (5) silvery-gray and brown.

Quite early in the season I first noticed its work. The larvæ were so small, and so near the color of the calyx of the flower, that it was almost impossible to catch the perpetrator until the mischief was done. They were hid away among the clusters of buds, and ate through the lower part of the calyx, completely destroying the flowers. At first they seemed to be mostly confined to the white and light-colored varieties of verbena, but later in the season they attacked all colors indiscriminately.

I also noticed that the pupæ were affected by lamp-light, a peculiarity that I had never observed in any other insect. One evening I brought several clusters of verbena buds, that were badly mutilated by these little pests, to the light of a lamp, which affected the pupæ so much that they worked and wriggled themselves entirely out of their cocoons; and I waited in vain to see them give forth the perfect insect, which, however, did not issue until two or three days after this.

After satisfying myself that this insect was not described in any work on the *Lepidoptera*, I sent it to Mr. Walsh, and he inclined to believe that it was a new and undescribed species; but added, he would let me know in due time. So it was left until after the death of Mr. Walsh, when Mr. Riley came across some of the moths I had sent to Mr. Walsh, and wrote: "Your Verbena Moth is my *Penthina Fullerea*. You will find it figured and described in *Tilton's Journal of Horticulture* for October, 1868. My hopes blighted again!

With a great feeling of disappointment I went to hunting among Tilton's old journals until I found the designated number; when, Lo! here it was figured as natural as life, with a full description of it in all its stages. From the account here given it would seem to like a greater variety of diet than Mr. Riley had supposed, although he had given it considerable latitude; but the Verbena is a long way from the Iris and Lily families.

As what I found in *Tilton's Journal* bears upon the name of this moth, and upon its food-plant as noticed by Mr. Fuller, and as it is also the first published account of this insect, I hope Mr. Riley will allow me to quote, in part, his letter to Mr. Fuller:

"The Tigridia-seed larvæ which you sent me last December have proved, as I suspected they might, to be an entirely new species. Ever since the 10th of March, I have been breeding from them a pretty little moth, belonging to the genus *Penthina*, and inclose, in accordance with your request, a brief description of the worm, its chrysalis and moth, together with some drawings, which will be of more value to you.

"The genus *Penthina* belongs to a sub-family of the *Tortricidæ* (a large group, whose larvæ live for the most part in seeds, buds, or between leaves, which they fasten with their silken threads); and it is characterized by the antennæ of the moths being simple; their upper wings being twice as long as broad, and arching in front from the shoulder; and by a tufted thorax. They rest with the wings in the shape of a roof, but rounded above, and somewhat approaching each other beyond the body. The sexes differ but slightly.

"It is quite probable that this species is not confined to the Tigridia, but will be found to attack the whole lily family, or at least the *Iridaceæ;* and I name it, therefore, in honor of yourself." MRS. MARY TREAT.

VINELAND, N. J., April, 1870.

[For the benefit of the scientific reader, we annex descriptions of these two insects in their different stages:

THE RASPBERRY GEOMETER (*Aplodes rubivora,* Riley.)—*Larva*—Average length 0.80 inch; 10-legged. Color yellowish gray, very minutely shagreened all over, and with other warty prominences as at Figure 125 *b.* Each joint with a prominent, pointed, straight projection each side of dorsum, and several minor prickles below. Two very slightly raised, longitudinal, light-colored lines along dorsum, between the prominent prickles. Feeds on the fruit and leaves of the Raspberry, and disguises itself by attaching to its prickles, and especially to the dorsal ones, pieces of dried berry, seed, pollen, anthers, and other *debris* of the fruit. These foreign substances are fastened to the prickles by aid of the mouth, from which a viscid silky matter is emitted for the purpose.

Pupa.—Length 0.25 inch. Formed within a slight cocoon. Pale yellow, inclining to flesh-color, with a darker dorsal line, a row of dark spots each side, and with longitudinal dark lines on wing-sheaths and antennæ; two slight projections anteriorly just above the eyes. Appears minutely speckled under lens.

Perfect Insect.—Alar expanse 0.50 inch, length of body 0.25 inch. Color verdigris-green, the scales being sparse and sprinkled over a light ground, so that the wings, when the least rubbed, appear sub-hyaline. *Head* short, fulvous; eyes inclining to green, with a deeper border; palpi pale; antennæ scarcely reaching to inner transverse line of front wing, white and convex above, fulvous and concave beneath; stout at base (where they are connected by a white transverse piece) and tapering to a fine point; those of the male fringed, those of the female simple. *Thorax* green on a fulvous ground. *Abdomen* slightly green on a fulvous ground, and with a whitish spot above, at base. *Front-wings* with two transverse light lines dividing the wing into three parts, proportionate, on costa, as 3, 4, 2 counting from base; the outer line scarcely sinuate and nearly parallel with posterior margin, being a little produced posteriorly between nerves 2 and 4; the inner line more decidedly sinuate and reaching the costa and inner margin at about the same distance from base; costa broadly white about the middle; posterior margin with a fine white line; fringes green: under surface silvery, with a tinge of green and with the transverse lines barely indicated. *Hind-wings* with two similar transverse lines, dividing the wing in like proportion, the outer line produced posteriorly between nerves 2 and 3; posterior border and fringe as in front-wings; under surface uniformly silvery-white, the lines barely indicated in certain lights. *Legs* short, the thighs of the first four inclining to green and their shanks to fulvous. Described from 2 ♂ and 3 ♀ bred specimens, in two of which there is, on front-wings, a faint line running to about one-third of wing from costa, between the two transverse lines.

This species resembles the *glaucaria* of Guenee, but is evidently distinct, if we are to judge from his description. We have another very closely allied species in this country, and one which is more common than *rubivora* It may be known as the Yellow-lined Geometer (*Aplodes flavilineata*), and it may be at once distinguished from *rubivora* by its somewhat larger size, by the transverse lines being broader, *yellow* or *fulvous* instead of white, and dividing the wings into three more nearly equal parts; by the outer lines running almost straight across both wings; by the inner ones on the front wings being much arcuated towards base near the costa, and on the hind wings being sub-obsolete; and lastly by the broad yellow costal and posterior border. The larva of this species has been found by Mr. P. S. Sprague, of Boston, Mass., feeding on the flowers of some composite plant, and it is furnished with similar spines and has the same habit of disguising itself as that of *rubivora.* These are the only two North American Geometers, the larvæ of which are known to be furnished with such spines; though that of *Hipparchiscus venustus,* Walsh, has *curled* lateral velvety appendages,* and that of *Nematocampa filamentaria,* Guen., has two pairs of long curled filaments on joints 6 and 8.†

Our Figure 125 represents the larva of *rubivora,* natural size at *a;* an enlarged lateral view of a segment at *b;* the moth natural size at *c* (the second half-line on hind wings is a mistake of the engraver), and an enlarged outline of the wings at *d* (the posterior line on hind wings is not sufficiently produced behind, between nerves 2 and 3).

THE VERBENA BUD-MOTH—*Penthina Fullerea,* Riley.—*Larva.*—Average length 0.50 inch. General color of a uniform dull carneous, frequently inclining to yellow and to green; two wrinkles on each joint, head jet-black, without a spot or shade; cervical shield also black, and occupying the whole upper surface of joint 1; piliferous spots in the normal position, but scarcely observable, even with a lens, except by the hairs proceeding from them; thoracic, abdominal and anal legs, and venter, of the same color as upper surface.

Pupa.—Average length 0.25 inch; of the usual form, with a distinct row of teeth above, on the anterior portion of each segment, and a few minute bristles at the extremity and along the sides Formed within a silken cocoon, constructed within the seed or bud which the larva inhabits: it forces itself half way out at one side, when the moth is about to emerge.

Perfect Insect.—Alar expanse 0.50 inch; length 0.23 inch. *Head,* with buff-brown tufts; eyes and palpi at tips somewhat darker; antennæ short (one-third length of front-wing), filiform and simple in both sexes. *Thorax* with the shoulder pieces and dorsal tuft of the same buff-brown. *Abdomen* more gray. *Front wings,* ground-color silvery-gray, with metallic blue reflections more or less intense; the lighter parts flesh-colored, with a silvery lustre, and the whole intricately shaded with dark Vandyke-brown, as in the figure. The light is most reflected from the edges of scales, which are beautifully shingled transversely. There are three principal dark-brown marks, namely, one broad and irregular, crossing the wing a little beyond the middle, and invariably containing a more or less complete pale ring on the posterior border just within the anterior median cell; and another, subobsolete, opposite, on its inner border: between this transverse band and the base is a smaller, irregular, brown mark, not extending to inner margin; and between the pale ring above described and apex of wing a third conspicuous brown mark, not extending more than one-third the width of wing. Each of these dark marks is relieved by a pale border and between them, the brown, blue and flesh-color are intricately mixed: apex rounded; posterior border dark, with a series of eight or nine more or less distinct rust-brown angular spots, just inside, the two largest being costal; fringes dark brown, with a deep blue gloss *Hind wings* light brown, becoming deeper around the posterior margin; fringes lighter. Whole under surface of a uniform leaden-brown—that of front wings somewhat darkest and showing costal marks No sexual difference except in the narrower and less pointed ♂ abdomen. Described from numerous bred specimens, those bred from Verbena buds showing no differences whatever from those bred from dry Tigridia seed. Our figure 126 represents an infested Trigidia seed (1), the larva natural size (2), the same magnified (3), the pupa shell (4), and the enlarged moth (5).—ED.]

* Proc. Bost Soc. Nat. Hist., IX, pp. 300-2

† Packard, Guide, etc, p. 321.

A CHRYSALIS FLYING.—Happening to be in my garden about the middle of June, I took to watching some butterflies flying among the cabbages. My attention was attracted to one by having, as it seemed to me, something strange on its back; I thought at first sight that it was being attacked by some ferocious insect; but on capturing it, which I succeeded in doing without difficulty, as its flight was a little heavy, I was not a little surprised to find that the poor Cabbage-butterfly (*Pieris rapæ*) was encased in its own chrysalis, its thorax and wings being out and its body within the chrysalis. I tried to extricate it from its peculiar position, but I found that its body was so completely fixed inside the chrysalis, that I could not get it out without injuring the butterfly. I killed it just as it was, and pinned it out; so it looks just like a chrysalis with wings.—A. M. F., *in Science Gossip.*

A METHODICAL TABLE OF THE CRICKETS.

Dear Sir: I send you a *Tableau Methodique* of the Crickets (*Gryllidæ*), which I have made up from Walker's Catalogue of this family—a work just issued, and which embraces not only the specimens in the British Museum, but all the species described up to the time of its issue. I have also added a list of the North American species of this family, not included in Mr. Scudder's Catalogue. C. THOMAS.

WASHINGTON, D C., March 14, 1870.

ORDER, ORTHOPTERA.

Sect. 2, SALTATORIA.

a.—Fore wings horizontal in repose. GRYLLIDÆ.
aa.—Fore wings deflexed in repose.
b.—Antennæ long, setaceous; tarsi 4-jointed. LOCUSTIDÆ.
bb.—Antennæ filiform, generally rather short. ACRIDIDÆ.

FAM. 1—GRYLLIDÆ.

Gryllides, Latr.; *Gryllina*, Macleay; *Achetidæ*, Leach; *Gryllodea*, Burm.; *Achetina*, Newm.

A.—Fore legs fossorial.
b. Hind tarsi of the usual form.
c. Tarsi 3-jointed.
d. Fore tibia hexadactylate. *Gryllotalpa*, Latr.
dd. Fore tibia didactylate. *Scapteriscus*, Scudd.
cc. Tarsi 2-jointed. *Cylindrodes*, Gray.
bb. Hind tarsi flat, digitate.
c. Four anterior tarsi 3-jointed. **Tridactylus*, Oliv.
cc. Four anterior tarsi 2-jointed. **Rhipipteryx*, Newm.
AA.—Fore legs not fossorial.
b. Head concealed. **Myrmecophila*, Latr.
bb. Head prominent.
c. Face rounded.
d. Hind tibiæ with spines.
e. Four anterior legs short, or but moderately long.
f. Third joint of the palpi not distinctly truncated.
g. Fore wings not very long.
h. Prothorax not very narrow.
i. Hind legs stout, of moderate length.
j. Hind tibiæ with stout approximate spines.
k. Tarsi 4-jointed. *Acheta*, Fabr.
kk. Tarsi 3-jointed.
l. First joint of the hind tarsi setulose. *Brachytrypes*, Serv.
ll. First joint of the hind tarsi smooth.
m. Head not ridged.
n. Head not conical in front.
o. Oviduct very narrow. **Gryllus*, Linn.
oo. Oviduct flattened. *Platyxyphus*, Haan.
nn. Head conical in front. **Mogoplistes*, Serv.
mm. Head ridged between the eyes.
n. Hind tarsi not serrated.
o. Fore wings regularly reticulated. **Tufalisca*, Walk.
oo. Fore wings irregularly reticulated.
p. Hind tibiæ not serrated. *Cassidava*, Walk.
pp. Hind tibiæ serrated. *Nessu*, Walk.
jj. Hind tibiæ with slender, wide-apart spurs.
k. Fore wings generally abbreviated.
l. Legs not very hairy.
m. Spines of the hind tibiæ not very long. **Nemobius*, Serv.
mm. Hind tibiæ with very long spines. *Argizala*, Walk.
ll. Legs very hairy. **Hapithus*, Uhler.
kk. Fore wings complete.
l. Fore wings membraneous.
m. Fore wings of the males not very broad.
n. Fore wings with transverse veins.
o. Prothorax not broader than the head.
p. Head not prominent between the eyes.
q. Fore wings with veins beyond the tympanum irregular. **Orocharis*, Uhler.
qq. Fore wings with veins beyond the tympanum regular. *Itara*, Walk.
pp. Head prominent between the eyes. *Madasumma*, Walk.
oo. Prothorax much broader than the head. *Lobeda*, Walk.
nn. Fore wings of the male very broad.
o. Legs not very slender. **Eneoptera*, Burm.
oo. Legs very slender. **Phyllopalpus*, Uhler.
mm. Fore wings of the male very broad.
n. Prothorax not narrower in front. *Eurepa*, Walk.
nn. Prothorax much narrower in front. { *Lerneca*, Walk. / *Salmania*, Walk. }
ll. Fore wings coriaceous.
m. Fore wings not reticulated. *Scleropterus*, Hag.
mm. Fore wings reticulated. **Lebussa*, Walk.
ii. Hind legs very long.
j. Fore femora and fore tibiæ not spiny.
k. Eyes not very prominent.
l. Second joint of the hind tarsi very distinct. *Podoscirtus*, Scudd.
ll. Second joint of the hind tarsi hardly apparent.
m. Wings complete. **Platydactylus*, Brulli.
mm. Wings none.
n. Spines of the hind tibiæ very short. *Laranda*, Walk.
nn. Spines of the hind tibiæ long. **Zaora*, Walk.
kk. Eyes very prominent.
l. Legs stout. *Orbega*, Walk.
ll. Legs slender. *Nisitra*, Walk.
j. (Not represented.)
hh. Prothorax very long and narrow.
i. Head elongated. **Œcanthus*, Serv.
ii. Head not elongated. **Laurepa*, Walk.
gg. Fore wings extremely long.
h. Body stout. *Turragu*, Walk.
hh. Body very slender. *Nocera*, Walk.
ff. Third joint of the maxillary palpi directly truncated. *Trigonidium*, Ramb.
ee. Four anterior legs very long.
f. Hind femora not abruptly attenuated. *Luzara*, Walk.
ff. Hind femora abruptly attenuated beyond the middle. **Phalangopsis*, Serv.
dd. Hind tibiæ without lateral spines.
e. Prothorax produced hindward. **Cycloptilum*, Scud.
ee. Prothorax not produced hindward.
f. Body stout. *Ornebius*, Guer.
ff. Body very slender. *Xabea*, Walk.
cc. Face very flat. *Platyblemmus*, Serv.

*Those represented in North America. ACHETA is restricted to *Schizodactylus monstrosus* of Blanch., *Hist. Nat.*, iii. 31; Serv. *Hist. Orth.*, 322.

A LIST OF SPECIES OF GRYLLIDÆ NOT INCLUDED IN SCUDDER'S CATALOGUE OF ORTHOPTERA.

Gryllus septentrionalis,	Walk. pg.	18.	Mexico, St. Dom.
" *luridus*,	"	18.	Vera Cruz.
" *determinatus*,	"	19.	Jamaica.
" *similaris*,	"	20.	St. Domingo.
" *angustulus*,	"	21.	Jamaica.
" *contingens*,	"	21.	Jamaica.
" *signatipes*,	"	22.	W. coast Am.
Mogoplistes occidentalis,	Scudd., *Pro. Bost. Soc. Nat. Hist.* Walk. p. 52.		Lower Cal.
Tufalisca lurida,	Walk. p.	53.	St. Domingo.
Nemobius mexicanus,	"	57.	Ojaco, Mex.
" *circumcinctus*,	Scudd., *Pro. Bost. Soc. Nat. Hist.* Walk. p. 57.		Mexico.
Hapithus quadratus,	Scudd., *Cent. Dec. Gryll.*		Texas.
Orocharis signatus,	Walk. p.	61.	Mexico.
" *scitulus*,	"	62.	Honduras.
" *fusiformis*,	"	63.	"
" *annulatus*,	Scudd., *Pro. Bost. Soc. Nat. Hist.*		Cent. Am.
Eneoptera insularis,	Walk. p.	66.	Jamaica.
Phyllopalpus latipennis,	"	68.	"
" *nigrovarius*,	"	70.	Mexico.
Lebussa tenuicornis,	"	75.	St. Domingo.
Platydactylus similis,	"	78.	"
Zaora cinctipes,	"	89.	Jamaica.
Œcanthus nigricornis,	"	93.	Illinois.
" *varicornis*,	"	94.	Mexico.
" *formosus*,	"	94.	"
Laurepe valida,	"	97.	Jamaica.

Cycloptilum squamosum,	Scudd., *Pro. Bost. Soc. Nat. Hist.*	Texas.
Scaptericus vicinus,	Scudd., *Rev. Foss. Crick.* 12, pl. 1, f. 4.23.	Cent. Am.

Œcanthus nigricornus, Walk., *Cat. Dermat. Salt.* p. 93. "*Female.*—Testaceous, slender, shining. Head slightly elongated, with three black stripes extending from the hind border, one between the eyes and one on each side below the eyes. Eyes elongated, slightly prominent. Third joint of the palpi clavate, obliquely truncated, longer than the second. Antennæ black, testaceous at the base, very much longer than the body. Prothorax slightly longer than broad, fore border and hind border testaceous; two longitudinal testaceous streaks in the disk. Ventral segments black. Cerci and oviduct a little shorter than the abdomen, the latter black. Legs black, very slender; fore tibiæ slightly dilated and excavated on the inner side near the base; hind femora testaceous toward the base; hind tibiæ with six minute spines on the outer side, and five on the inner side. Fore wings cinerous, extending much beyond the abdomen, regularly reticulated; mediastinal vein with nine oblique branches. Hind wings extending much beyond the fore wings. Length of body 7½ lines. Illinois. Presented by E. Doubleday, Esq."

I give this in *extenso* for the benefit of our Western Entomologists, who may not as yet have received Walker's Catalogue.

A GOOD WORD FOR THE TOAD.

Mr. Riley: I was much interested in some extracts from "Fogt's Book on Noxious and Beneficial Animals," in your January number, and am induced to send you my own experience as another proof of the intelligence of toads.

Loving flowers, even when a child, with that love which makes a happiness of labor and patient waiting, my earliest possession was a small flower garden. I had been told that toads were very useful in a garden, and consequently transferred them, as they were occasionally found, to my own especial domain, which happened to be enclosed by a low brick wall and paling fence.

Although my toads seemed none of them afraid of me, I soon fancied that one of them followed me about my flower borders; and, watching carefully, I found my fancy to be a truth. My toad grew more and more attentive with time, and I frequently talked to him as he seemed watching my labors, and sometimes he would hop immediately where I was digging, then I quietly lifted him on one side with my trowel, saying: "Tom, you are in my way."

One day I threw some sweet crumbs that were in my pocket towards him, and was much amused to see him catch them before they fell to the ground. You will readily suppose that after this "Tom Toad" was very liberally fed. He grew fast, and his skin became very glossy, and the spots very brilliant; and I soon found that he not only knew my voice, but also my step. "My pet" became quite the jest of the neighborhood, and it was a common thing for my friends to sit upon the steps leading to the house, for me to call "Tom," and see him come hopping from some secluded place to catch his crumbs.

The windows of the basement opened on to my garden, and as the servant girls would be ironing by the windows, the toad often hopped in to watch their labors. They always bore the call quietly, unless he hopped upon the table or into the clothes basket, when the screams were loud for me to "come and take care of my bird." And thus, for about six years, Tom was made as comfortable and happy as a toad could be.

He always burrowed his winter quarters for hibernation in one place—directly by the kitchen window—and in early spring, as the weather grew warmer, the earth would gradually loosen and heave up over his back, and all at once he would hop forth. I did not particularly notice his condition, but for a day his movements were rather sluggish. I sometimes used to uncover him when he had come very near the surface, and tell him it was "time to get up;" and I dug away once to see how far he went down for his winter nap, and found the hole about a foot deep.

But at last, when I was about to leave home for a long term at school, it was insisted that "Tom" must be carried away, they were so senselessly afraid of him, and I carried him tenderly to a beautiful spot by our beautiful river, and said "good-bye." I never saw my toad again, and have never had such healthy rose bushes since.

Not long ago, I was telling of my toad to a friend, when he said that "one day he observed a toad in his garden always hopping in his way. He impaled a fly and held it to the Toad, who snapped it off from the stick in an instant. Daily, for quite a length of time, he amused himself with feeding the toad, until once, in mischief, he held to it a bee, and he thinks the bee stung the Toad, for it would never again notice him. E. U. B.

Bar Mills, Minn.

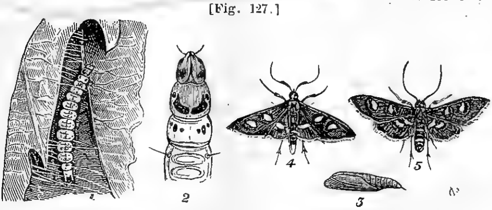
Insects Boring Liquor-casks.—There is a very small species of wood-boring beetle, known as the *Tomicus monographus,* which has for a number of years past been very destructive in India to casks containing malt liquors. More than one million of the small perforations made by this insect have been observed in one stave. Dealers in malt liquors suffer greatly from these pests, and are anxious to discover a preventive. This borer has lately been examined by British entomologists, who are endeavoring to ascertain whether this insect feeds on the oak staves for the liquor they contain, or because they are really fond of oak wood.—*Hearth and Home.*

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 8.

The Grape Leaf-folder.

(*Desmia maculalis,* West.)

[Fig. 127.]



Colors—(1 and 2) grass-green; (3) brown; (4 and 5) black and white.

The subject of this sketch has long been known to depredate on the leaves of the Grape-vine in many widely separated parts of North America. It is not uncommon in Canada West, and is found in the extreme southern parts of Georgia. It appears to be far more injurious, however, in the intermediate country, or between latitude 35° and 40°, than in any other sections, and in Southern Illinois and Central Missouri proves more or less injurious every year. It belongs to the same family (ASOPIDÆ) as our notorious Clover-worm, which attacks our clover stacks and mows. It was first described and named by Westwood*, who erected, for it, the genus *Desmia*.

This genus is characterized by the elbowed or knotted appearance of the ♂ antennæ, in contrast with the smooth, thread-like ♀ antennæ; the maxillary palpi are not visible, while the compressed and feathery labial palpi are recurved against the eyes, and reach almost to their summit; the body extends beyond the hind wings.

The moth of the Grape Leaf-folder is a very pretty little thing, expanding on an average almost an inch, with a length of body of about one-third of an inch. It is conspicuously marked, and the sexes differ sufficiently to have given rise to two names, the female having been named *Botys bicolor*. The color is black, with an opalescent reflection, and the under surface differs only from the upper in being less bright; all the wings are bordered with white. The front wings of both sexes are each furnished with two white spots;† but while in the male (Fig. 127, 4) there is but one large spot on the hind wings, in the female (Fig. 127, 5) this spot is invariably more or less constricted in the middle, especially above, and is often entirely divided into two distinct spots. The body of the male has but one distinct transverse band, and a longitudinal white dash at its extremity superiorly, while that of the female has two white bands. The antennæ, as already stated, are still more characteristic, those of the male being elbowed and thickened near the middle, while those of the female are simple and thread-like.

There are two broods in this latitude—and probably three farther south—during the year; the first moths appearing in June, the second in August, and the worms produced from these last hibernating in the chrysalis state. The eggs are scattered in small patches over the vines, and the worms are found of all sizes at the same time. These last change to chrysalids in 24 to 30 days from hatching, and give forth the moths in about a week afterwards.

The worm (Fig. 127, 1) folds rather than rolls the leaf, by fastening two portions together by its silken threads; and for this reason, in contradistinction to the many leaf-rollers, may be popularly known as the "Grape Leaf-folder." It is of a glass-green color,* and very active, wriggling, jumping and jerking either way at every touch. The head and thoracic segments are marked as at Figure 127, 2. If let alone these worms will soon defoliate a vine, and the best method of destroying them is by crushing suddenly within the leaf, with both hands. To prevent their appearance, however, requires far less trouble. The chrysalis is formed within the fold of the leaf, and by going over the vineyard in October, or any time before the leaves fall, and carefully plucking and destroying all those that are folded and crumpled, the supply for the following year will be cut off. This should be done collectively to be positively effectual, for the utmost vigilance will avail but little if one is surrounded with slovenly neighbors.

We believe this insect shows no preference for any particular kind of grape-vine, having found it on well nigh all the cultivated, as well as the

* Mag. Zool., par M. Guerin, 1831; pl. 2.

† Mr Glover, in the Agricultural Report for 1854, p. 79, says that the male has a semi-lunar mark of white on the outside of each spot, which in his figure, pl 6, ibid., is very distinct. In dozens of specimens bred in Illinois and Missouri no such mark appears, though there is an apparent coincident shade, barely distinguished from the black ground-color, on the outside of each spot in both male and female.

* We subjoin a description of this worm, as first given by us in the Prairie Farmer Annual for 1868. Average length, 0.80. Largest on abdominal joints, and tapering thence slightly each way. Color glass-green, always darker above than below. A narrow darker dorsal line, with each joint swollen into two transverse wrinkles. Laterally paler or yellowish, and a large and distinct piliferous spot on each joint, with others scarcely visible with a lens. Head fulvous, polished, horizontal, with two small eye-spots and two larger dark patches. Joint 1 of the same color, and marked as in Figure 127, 2. Joint 2 has two small spots, with an intermediate larger one, on each side Legs yellowish. Acquires a carneous or pink tint before changing to chrysalis, which latter is of the normal color, size and form of Figure 127, 3, and has at the tail several very minute curved hooks, joining and forming into a point

wild varieties. Its natural enemies consist of spiders, wasps, and a small undescribed species of *Tachina* fly which we have ascertained to infest it in the larva state, and to which we have given the MS. name of *desmiæ*. There is every reason to believe that it is also attacked by a small clay-yellow beetle, the Grape-vine Colaspis (*Colaspis flavida*, Say), which, though a vegetable feeder, may often be found in the fold of the leaf in company with some shrunken, half-dead worm.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

ROT IN PEACHES AND OTHER FRUITS.—*New Harmony, Ind., April* 20, '70.—I grow but few peaches and observe those closely, and I believe that I have generally, if not always, found that the rot proceeds from a bite, which I suspect is often made by a locust or grasshopper (*Locustadæ*), but I *know* that it is very often made by a brown soft-bodied insect that I call a cricket: it is, I think, a little bulkier than the insect figured in the ENTOMOLOGIST as the Snowy Tree Cricket. I have caught many of them while they were eating peaches and quinces. Shortly before the quince becomes tinged with yellow these creatures bite small pieces out of them; in certain conditions of the quince and of weather the wound heals, but the bites made when the weather is wet, or the quince is ripening, are fatal. Rot commences around the hole and rapidly spreads, and the small hole made by the bite is so obscure as not to be noticed by those who do not expect to find it. The same process goes on in the peach; it is attacked before it is nearly ripe, and in all its after stages; but the peaches do not fall until a mass of rotten matter almost obliterates the sign of the cause of the rot. Apples are injured in the same manner. Nearly all the rot that I have perceived in these varieties of fruit, I have found has commenced from the outside, and in that grown by ourselves I have found the sign of the bite, excepting where some, out of my reach, has been allowed to fall and smash. In the fruit I have bought I have often found the same sign, but very often I forget to examine; and, of course, most of the bitten fruit is left to rot in the orchard, or is consumed by pigs, and is not examined by any one. A fruit-grower here, in derision of my opinion, handed me two rotten apples and asked if they were bitten; I showed him that there was more than one bite mark on each of them, though these marks were somewhat obscured by the rot which ensued. I suppose this brown cricket (a chestnut-brown) when mature has the wings peculiar to its order; but I think when I have caught it, it has been wingless: it is easily crushed, and not easily caught without crushing.

[We shall be glad to receive specimens of the cricket in question. It may be the Jumping Cricket (*Orocharis saltator*, Uhler), which we know to have the pernicious habit of severing green grapes from their stems, and thus allowing them to fall upon the ground. We are well aware that the bite or puncture of any insect will induce rot in the fruits mentioned, when other conditions are favorable; and this fact only confirms our opinion, as expressed on page 137, that the puncture of the Plum Curculio has no special or peculiarly poisonous effect, and that it cannot be the sole cause of the Peach rot, as some persons contend it is.—ED.]

CLOVER-WORMS—*Eureka, Mo., April* 21, '70.—I am very thankful for your answer about the Clover-worm; but I have yet a little curiosity to know how the worm gets into, or why it chooses the center and bottom of the stack. Mr. Walsh's supposition (Pract. Ent., I, p. 83) cannot be correct, for my stack was on a new foundation, and at least two hundred yards away from any previous stacking place. G. PAULS.

[In the *Prairie Farmer* of April 20th, 1867, we have shown that Mr. Walsh was wrong in supposing that this worm can only increase prodigiously where clover has been stacked for successive years in the same place; and we have also demonstrated that the principal reason why they are so generally found at the bottom of a stack in winter, is, that they are attracted there for warmth and moisture.—ED.]

FLAT-HEADED APPLE-TREE BORER—*Eureka, Mo., April* 21, 1870.—Last fall, and early this spring, and even quite recently, I found on my apple trees small specimens of *Chrysobothris femorata*, about one-quarter inch long, or just of the size which the main crop has acquired in the month of August. I can only conclude that the eggs were either laid late in the fall, or that the annual soft-soaping in May so weakens the constitution of the larva that it cannot mature in the proper season. I have had but three borers escape my notice and get large enough to go into the wood, or body of the tree, and in every instance they penetrated in a straight or horizontal direction, for about one to one and a half inches, and then *downwards*. I fully indorse Mr. Wielandy's article on borers, in No. 5; especially what he says about the general fate of apple trees planted in this part of Missouri. It was the fate of my first planting, and as long as people consider $2.00 too much for your paper, and entomology beneath their notice, they will have to learn the truth from woful experience. I can now, thanks to the teachings of the ENTOMOLOGIST, show trees as fine, smooth, and vigorous, probably, as those of Mr. Wielandy; though I cannot say that I am free from the borer.

[The young borers which escaped your vigilance last summer wintered in a dormant state, which accounts for your finding them of the same size either in early spring or late fall.—ED.]

FLOCK OF BUTTERFLIES—*Waxahachie, Ellis county, Texas, March* 31, 1870.—During my ramble this morning I happened upon a flock or bevy of butterflies, known as *Danais archippus*, Fabr., containing thirty individuals, four of which I captured for the purpose of identification, only two of which, however, I pinned down. I find them to be of the genuine *archippus*, identical in every respect, with specimens bred from the caterpillar by myself last summer, except in that of color, which is somewhat paler in these captured this morning than it was in those bred by me in the summer. They have the appearance of having been on the wing some days. The interesting question is, do they hibernate in the imago state, or in that of the chrysalis? They are wholly in advance of their larval food-plant, *Asclepias obtusifolia;* and from my observations upon the habits of the species, I infer that they hibernate as chrysalids. Please give us the facts as to the manner and condition in which they spend the winter, and oblige yours, respectfully,

L. J. STROOP.

[They undoubtedly hibernate in the perfect state, for we have often captured pale, faded and worn specimens quite early in the spring of the year.—ED.]

AN ANOMALOUS GRAPE SPHINX MOTH—*Covington, Ky., April* 19, 1870.—A friend yesterday gave me a badly battered specimen of a *Philampelus,* which is such a curiosity that I write to inquire about it. In size, and in the size and shape of the markings, it is identical with *P. satellitia,* as figured on page 90 of the present volume of the ENTOMOLOGIST, except that under the double discal dots of the anterior wings is a very short and narrow longitudinal dash. (Your figure has three small dots, but all of my specimens of *satellitia* have only two, although agreeing in all other particulars with your figure.) But the peculiarity about this specimen is, that a longitudinal line down the center divides the insect so that all of the spots and patches on the right side of the thorax and abdomen and front wing are light green, except the one on the thorax at the base of the wing and the large one on the hind margin of the wing near the base, which are of a rich dark green, not at all the color of *P. satellitia,* which I call rather dusky than green. The spots on the left side of the body and left wing are rust-red, varying to a light yellow drab; that on the thorax at the base of the wing, and that on the posterior margin near the base, being darker than the others. The line down the middle would divide the band across the metathorax and first abdominal segment into the same two colors. The spots on the two sides of the abdomen also differ, but not so glaringly. The hind wings are alike except that the drab appears again at the posterior angle of the left wing; otherwise the hind wings do not differ from those of *P. satellitia.* The ground color of the left anterior wing is also much lighter than that of the right wing. Both antennæ are missing.

It is clearly not *P. achemon* or *satellitia,* as figured by you; nor *P. Linnei,* nor *Lycaon,* as figured by Grote (*Pr. Phil. En. So.,* Vol. V., pl. 3). Indeed, the only one of these for which it could be mistaken, would be a hermaphrodite *satellitia,* in which there had been a wide departure from the normal colors even on the right side. But then I have never heard that there is any difference as to color between the ♂ and ♀ *satellitia.* A hole made by some insect in the side of the abdomen shows that it is a female, for the abdomen is full of eggs. It was picked up dead by some children last summer. What can you make of it? V. T. CHAMBERS.

FOOD-PLANT OF GREEN SPRANGLING SLUG-WORM—*Elizabeth, Ind., March* 19, 1870.—The green, oval, flattened object, with lateral, tooth-like appendages, fringed with hairs, the two at the tail being longer than the others, and which you say is an undescribed species of *Limacodes,* or Slug-worm, sent you by me several weeks ago, were found feeding upon the leaves of a tree growing along the Ohio river and creek bottoms in this country, known as the Sycamore tree. I have ascertained this since the specimens were sent to you. Some of the specimens were much larger than the one sent.

LEVI G. SAFFER.

ERRATA.—Page 152, column 1, line 21, for "one" read "our." Page 163, column 2, line 6, for "results" read "result." Page 168, column 1, lines 15 from top and 6 from bottom, for "*Alanda*" read "*Alauda.*"

THE PERIODICAL CICADA, *alias* THE 17-YEAR AND 13-YEAR LOCUST.

In the Missouri Entomological Report for 1868 will be found the following account of two broods of these singular insects, which are to appear the present season:

BROOD III.—*Septemdecim*—1853, 1870.

In the year 1870, and at intervals of seventeen years thereafter, they will in all probability appear in what is known as the "Kreitz Creek Valley," in York county, Pa., and possibly in Vinton county, Ohio, and Jo. Daviess county, Ills. Mr. S. S. Rathvon, of Lancaster, Pa., speaking of this brood, 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—Brood XXII). 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 seventeen years from time immemorial." Dr. Smith records their appearance in 1853, both in Vinton county, Ohio, and Jo. Daviess county, Illinois.

BROOD IV.—*Tredecim*—1857, 1870.

In the year 1870, being the same as the preceding, they will in all probability appear in Jackson, Gadsden and Washington counties, Florida, having appeared there according to Dr. Smith in 1844 and '57.

We earnestly ask our subscribers, who happen to live in the several parts of the country there mentioned, to report to us whether or not the insects appear according to prediction, as we wish either to verify and confirm, or disprove, the genuineness of these broods. We have every confidence that the 17-year brood (III.) will duly appear, as our correspondent, Mr. Rathvon, who has observed it in past years, is still living to make further observations; but as Dr. Smith, who recorded the appearance of the 13-year brood (IV.) is now dead, it would be very gratifying to have its periodic visits, at intervals of thirteen years, confirmed.

If any of our Georgia subscribers can give us the proper information, we should also very much like to know whether or not the Periodical Cicada appeared last year (1869) in Habersham, Muscogee, Jasper, Greene, Washington and adjacent counties in that State.

☞ Determined that our Journal shall stand solely on its merits, we take pleasure in being allowed to mention as contributors, among others, the following well known Entomological writers: Baron Osten Sacken, N. Y.; Dr. H. Hagen, Cambridge, Mass.; A. S. Packard, Jr., Salem, Mass.; F. G. Sanborn, Boston, Mass.; F. N. Norton, Farmington, Conn.; P. R. Uhler, Baltimore, Md., Dr. Jno. G. Morris, Baltimore, Md.; Dr. Wm. LeBaron, Geneva, Ills.; Rev. C. J. S. Bethune, M. A., Credit, C. W.; S. S. Rathvon, Lancaster, Pa.; Dr. H. Shimer, Mt. Carroll, Ills.; Dr. J. P. Trimble, Newark, N. J.; J. P. Stelle, Savannah; Tenn., and Mrs. Mary Treat, Vineland, N. J. We shall spare no means to make this magazine valuable alike to the practical and scientific reader, and we really hope that our friends, who appreciate our efforts, will speak a good word to their neighbors, as occasion may present. Sample copies sent free to any address.

THE DEATH-WEB OF YOUNG TROUT.

Soon after the article on page 174, with the above heading, was in type, we received from Mr. Seth Green specimens of the web-worm in question, and the mystery was soon solved. The worm is the larva of a two-winged fly belonging to the genus *Simulium*, the species of which are so well known to torment both man and beast by their irritating bites. In our next number we shall publish an interesting article on the transformations of this genus, from the pen of Baron Osten Sacken, accompanied by fitting illustrations.

CHOICE FLOWERS.—We thankfully acknowledge the receipt, in excellent condition, of a fine assortment of Greenhouse and Bedding plants, from the well-known Chicago florist, Edgar Sanders. We never before received plants from a distance that looked so fresh and healthy. It is no wonder that Mr. S. receives so large a share of the Western patronage, for he well deserves it; and our readers, who wish assortments of plants well grown, will do well to send to 100 Madison street, Chicago, for a catalogue.

ON OUR TABLE.

THE BUTTERFLIES OF NORTH AMERICA, with colored drawings and descriptions, by Wm. H. Edwards, American Entomological Society, Philadelphia. Part V. Price $2 50. We cannot say more in favor of this part than that it equals the preceding parts in every character. The species described and figured are *Argynnis Edwardsii*, *Colias eurydice*, *Limenitis lorquini*, *Grapta faunus*, *Lycæna pseudargiolus*, and *L. neglecta*. The synopsis of N. A. species is continued.

TRANSACTIONS OF THE AMERICAN ENTOMOLOGICAL SOCIETY. Vol. II, Part IV.

THE COUNTRY GENTLEMAN'S MAGAZINE for January, February, March and April. London.

PETITES NOUVELLES ENTOMOLOGIQUES.—Paris: M. E. Deyrolle, Fils. [We have only received two Nos.]

WOODWARD'S ARCHITECTURE.—Geo. E. Woodward, 191 Broadway, N. Y.

CONTRIBUTIONS TO THE NATURAL HISTORY OF NOVA SCOTIA; INSECTA, COLEOPTERA. Part I. By J. Mathew Jones, F.L.S.

ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

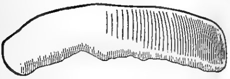
We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

How to Study and Breed Insects—*Jason E. Cowden, Amesbury, Mass.*—You are referred to the series of articles, from the pen of Mr. F. G. Sanborn, now appearing in our magazine.

Chas. E. Billin, Philadelphia, Pa.—Please refer to same article. See also page 68 at bottom of column 2.

Shed Snake Scale—*Jas. R. Hawkins, Vandalia, Ills.*—We have on two former occasions received just such an object as you send, and as your own words fitly describe it, we quote them: "Having a very rare specimen in my collection, I take the liberty of asking your opinion of it. It is about an inch and a quarter in length, by one-quarter in breadth, and is almost as thin as tissue paper. It is semi-transparent, and an ordinary microscope reveals no organs of life whatever. Still it is possessed of motion, and can travel over a table pretty briskly after the fashion of a measuring-worm. Its body seems hard to the touch, and has a fine polish which reflects the colors of the rainbow. When disturbed it quickly coils up like a watch-spring. I think a small piece of tissue from the inside of an onion, cut the proper length, would have a close resemblance to it. It was found on an old decayed log."

[Fig. 128.]



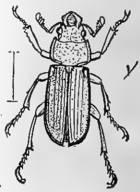
Color—Translucent white.

This wonderful creature is in reality a shed abdominal scale of some snake, and lest some other of our readers may at some future time be as sorely puzzled over it as you have been, we give an outline of it at Figure 128. Hairs and other epidermis are more or less hygrometric, and readily move under a change in the condition of the air. These snake scales are so sensitive that they will readily pulsate in keeping with the beatings of the heart, if the finger be held close to one end. We incline to believe, however, that its contracting has caused you to stretch the story of its moving briskly over a table *just a leetle*. If you place a hair on a hot stove, you will find that it will curl up as rapidly as the Hair-worms described in this number by Professor Leidy.

Worms under Mulch Hay—*J. F. Flagg, Meadville, Pa.*—The dirty brown worms, about one-half inch long, having a small shiny, brown, retractile head, four longitudinal rows of minute black spines, and terminating abruptly at the tail with a flesh-colored proleg below, and four pointed fleshy protuberances above, are the larvæ of some species of Crane-fly (*Tipula*). We have long since been acquainted with these worms, but they have never, so far as we know, been bred to the perfect state. We have observed them, in the month of February, crawling by thousands over the snow and ice in a meadow; and your finding them under the hay and leaves used as a mulch around your rose-bushes, is quite in accordance with their habits, for they love moist and cool situations. They feed on decomposing vegetable matter, but also sometimes seriously injure grass meadows by devouring the living roots. A little salt, sprinkled over the ground before the mulch is applied, would doubtless prevent their appearance, if that is what you desire. They are not cut-worms.

A new Pear-tree Insect—*E. J. Ayres, Villa Ridge, Ills.*—The blackish beetles with a greenish cast, and finely punctured, which have injured so many of your young pear trees, by completely eating out the ends of the new shoots, and of the buds just before they burst, belong to the family of "Horn-bugs" (LUCANIDÆ), as they are called in this country, or "Stag-beetles," as they are termed in England. The species is the *Platycerus quercus*, Sch., and may be known in popular language as the Oak Horn-bug. As its name would imply, it is perhaps common on the different kinds of oak, though we have met with it on but few occasions ourselves, and have never before heard of its destructive habit of devouring pear buds. In the larva state it feeds on dead oak logs and stumps. Attracted by the earlier development of the pear buds, compared with those of the different oaks, these beetles, with appetites sharpened by a long winter fasting, are led to invade your orchard during the early part of the season, but will in all probability retire to their usual haunts in the woods, as soon as there is a fit supply of their more natural food. But as your orchard is surrounded with timber and is more or less subject to such invasions every spring, we should advise you in future to protect the smaller trees just planted by covering them with millinet, as it is difficult to ward off beetles which fly so readily by any other means. As this is an entirely new enemy to the Pear we give an outline sketch of the female (Fig. 129), the male differing only in his somewhat larger size, and his rather more robust mandibles.

[Fig. 129.]



Color—Black, with a faint olive-green hue.

Apple-twig Borer—*Joel B. Myers, Iola, Kans.*—The brown beetle which you found boring into a small pear tree at the axil of a limb, is the ♀ *Bostrichus bicaudatus*, to which we have frequently referred in back numbers.

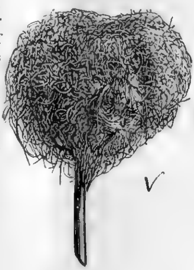
Cocoons of Polyphemus Moth—*H. J. Dunlap, Champaign, Ills.*—Your cocoons, found on a Morello Cherry tree, are those of the Polyphemus Moth (*Attacus polyphemus*, Linn.), which was figured in the March (1869) number of this magazine.

Galls on supposed Dock—*S. V. Summers, M.D., St. Louis, Mo.*—The galls on what you take to be some species of *Rumex*, are in reality the Golden-rod Moth Gall (*Gelechia gallæsolidaginis*,* Riley). You have doubtless been led into the error of confounding the two plants from finding these old Golden-rod stalks near some growing dock. We have long since known that *Chrysomela* [*Gastrophysa*] *cyanea*, Melsh., breeds on Dock, and from this habit, it might appropriately be called in popular language the Dock Leaf-beetle.

*Mo. Ent. Rep., I, p. 178.

Mossy Rose Gall—*W. M. Locke, Honeoye Falls, N. Y.*—The moss-like bunches (Fig. 130) of which you found eight on a single rose bush, and which attracted your attention from their resemblance to an old quid of tobacco, are polythalamous galls. They are composed of an agglomeration of hard cells, many of which are at present vacant, though some yet contain larvæ. The gall-fly which causes this gall is the *Rhodites rosæ*, Linn., an insect which Baron Osten Sacken found to be identical with a species which makes a similar gall on the rose in Europe, where it is known as the *Bedeguar* of the rose. The fly measures about 0.15 inch in length, and is principally distinguished by the ♀ having a black tip to her reddish abdomen. The larva of this gall-fly very closely resembles that of the Pithy Blackberry gall, represented in No. 5, at Figure 103, *c*. It is yellowish, has but 12 joints, of which the 4th is very short, and the 11th and 12th quite small; it has 7 pairs of spiracles, namely, a pair on each of joints 2, 5, 6, 7, 8, 9 and 10, and a large oval horny yellowish patch on each side of joint 1. The jaws are dark, and the head, in repose, is always bent under on to the breast. A parasitic larva often occurs in this gall, but may easily be distinguished from the true gall-maker by its whiter and more opaque color, its 13-jointed and slightly hairy body, the joints being less deeply separated, and by the absence of the horny piece on joint 1, and the more elongate and less bent forepart of body.

[Fig. 130]



Color—Green when fresh, yellow when dry.

[Fig. 131.]

Color—(*stem*) green; (*punctures*) gray.

Punctures on Rose Twig—*Geo. W. Copley, Alton, Ills.*—The punctures in the stem of the Multiflora Rose, and which we illustrate herewith (Fig. 131), are made by some insect unknown to us, for the purpose of depositing its eggs. There are ten of these rounded punctures, about one-half inch distant from one another, the fibres of the wood being torn in shreds longitudinally, looking very much like hemp, and contrasting strongly with the crimson and green bark of the twig. Upon cutting into these punctures the wood is found to be discolored and dead, as far as they extend, and in the centre of the pith, placed longitudinally, is an elongate dull yellow, opaque, soft, more or less flattened egg, 0.22 inch long and 0.04 wide, the anterior end tapering to a tolerably fine point, the posterior end more blunt. From the size and appearance of this egg we infer that it belongs to some Cricket (GRYLLIDÆ), and if we succeed in rearing it we will report results.

Snout-beetle—*M. T., Vineland, N. J.*—The Snout-beetles which you find so numerous, are *Hylobius confusus*, Kirb. We know nothing of its habits; but the beetles of this genus are timber borers, and usually in pine.

The Oyster-shell Bark-louse in Missouri—*B. P. Hanan, Luray, Clarke county, Mo.*—The section of a branch of a Sweet June apple tree, which you cut from the orchard of Dr. Wm. H. Martin, of Kahoka, in your county, is in reality covered with the scales of the common Oyster-shell Bark-louse (*Aspidiotus conchiformis*, Gmel). It is furthermore covered very thickly, and the white eggs underneath the scales are plump and healthy. This matter is of such vital interest and importance to the State of Missouri, and especially to those living in your county, that we quote part of your letter:

[Fig. 132.]

Color — Greenish brown, the eggs under the scales milk-white.

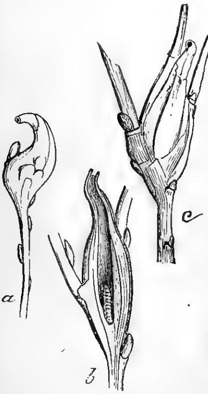
"This tree is rather badly infested, and I find by examination that they (the insects) are spreading slightly onto the nearest trees around it. Will they spread from one orchard to another, one or two miles distant? I saved my orchard from the native White Bark-louse, by sending you specimens of them and of their foes, and by learning from you what to do to destroy the lice. I took your advice; encouraged the ladybirds, and they cleared my trees of the lice. If your advice in this case shall accomplish as much for my friend, Dr. Martin, the object of this communication will have been accomplished."

In our First State Report we published a full account of this insect, and demonstrated that though it was perfectly able to live and thrive in the northern half of the State, and had proved ruinously injurious in the adjoining sections of the States of Iowa, and more especially of Illinois; yet, in all probability, it was entirely unknown in our own State. In view of these facts, we laid great stress upon the importance of preventing its introduction, and of thus retaining the immunity which we had so far enjoyed. In the paper read before the State Horticultural Society at its last annual meeting, and published in No. 4 of the present volume of this magazine, we again called attention to the subject; and now for the first time we learn that this pest has actually been introduced, and our worst fears are but too surely realized! Just as might have been expected, too, the insect first gains a footing in the extreme northeast corner of the State—the point of greatest proximity to the infested sections of Illinois and Iowa. From the contents of your letter we infer that the lice are yet confined to the particular tree from which you cut the infested twig, and to a few of those surrounding it, and in the name of the State, we earnestly ask Dr. Martin to have this tree cut down to the ground, and every particle of it burned before the young lice hatch from the eggs now under the scales. The other trees should also be critically examined and properly treated. We cannot here repeat what we have already written on the subject, but refer you to the article above-mentioned, for the natural history of this insect, and the proper remedies to apply; and if Dr. Martin follows our advice, he can rest assured that it will not only accomplish as much for him as it did for yourself, but that it will also be of immense benefit to the State. It would be well to send to Chas. W. Murtfeldt, 612 N. Fifth street, St. Louis, for a dozen copies of the State Agricultural Report for 1868, which contains the article, so that it may be distributed among Dr. Martin's neighbors. We must, at all cost, stamp this insect out, before it spreads any further, and in order to definitely ascertain the limits to which it has gone, we shall visit your county during the summer. If unmolested, this Bark-louse will not only spread from one orchard to another, one or two miles distant, but will in time spread through the whole county, and continue its destructive course like a devouring flame, from one county to another, until eventually the whole northern portion of the State is infested so that orchards may have to be abandoned, as they have often been in other States on this account.

Those trees which are not cut down, should be closely watched, and thoroughly syringed with strong tobacco-water, as soon as the young lice commence crawling about, which will be about the first of June. About two weeks after this syringing (just the time, by the way, to prune) cut off all the terminal twigs and burn them, by which means you will be apt to destroy any lice that escaped the syringing process, as they prefer to fix themselves around the ends and knots of such young terminal twigs. The ladybirds, which devour this as well as the native white species, should also be encouraged. For the benefit of those who are not yet acquainted with the appearance of the Oyster-shell Bark-louse, we produce an illustration (Fig. 132) of an infested piece of bark, at the head of this answer.

The Pod-like Willow Gall—*J. R. M., Woodburn, Ills.*—The oval woody galls, averaging 0.75 inch in length and 0.40 inch in diameter, and terminating in a conical beak, which galls you find growing from the tips of the twigs of the Osier willow [*viminalis?*], and which we illustrate herewith, are the Pod-like Willow gall (*Salicis siliqua*, Walsh). This gall occurs on no less than six different Willows, namely, *Salicis humilis, S. discolor, S. rostrata, S. cordata, S. petiolaris, S. lucida*, and if yours were found on *S. viminalis*, that will make the seventh, and we therefore hope you will identify the species. Though slight differences, in size more especially, are noticeable between the galls growing on the different species of Willow, yet they are all produced by the same species of gall-gnat, which was originally described as *Cecidomyia salicis* by Dr. Fitch, in the American Quarterly Journal of Agriculture and Science, Vol. I, p. 263. The name *salicis* was, however, already preoccupied by an European species, and Mr. Walsh afterwards redescribed it under the name of *siliqua* (Proc. Ent. Soc. Phil., III, p. 591). The fly is one of our largest species, and the specimens from your galls issued about the middle of April. The pupa when about to change, works itself partly out of the terminal beak of the gall, and after the fly has escaped, the pupal integument, which is characterized by all the parts except the abdomen being dusky, frequently remains attached at the orifice. Our figure at *b* represents a section, showing the larva.

[Fig 133.]



Color—Same as twig; the larva orange.

Bee Nest—*J. R. Muhleman, Woodburn, Ills.*—The delicate silken cells, each about 0.22 inch long, which are placed contiguously in a hollow currant stem, the bore of which has a diameter of 0.12 inch, are built by some species of small bee, and in all probability, as you suggest, by one belonging to the genus *Ceratina*. The larvæ which are now (March 25th) contained in these cells agree (as the cells themselves do) very well with Dr. Packard's description of those of the Double Ceratina (*C. dupla*, Say*). Should they prove to be this species, an important error in its natural history will be corrected; for, from the fact that the ♀ has been observed to deposit eggs in the middle of May, Dr. Packard concludes that there is but one brood each year, and that the perfect insect hibernates. If we are right in referring these cells to *Ceratina*, however, there are evidently two broods each year, the second brood hibernating in the larvæ state; and this seems the more likely, since even in New York and Massachusetts the perfect bees appear in July from eggs deposited in May. We present (Fig. 134) an illustration of these cells at *a*, and of the magnified larva at *b*; and if we succeed in breeding the bee will report further.

[Fig. 134]

Color—(*b*) yellowish-white.

Beetles Named—*S. V. Summers, St. Louis, Mo.*—Your insects are as follows: No. 1, *Gyrinus analis*, Say. No. 2, *Aphodius bicolor*, Say. No. 3, *Hydrophilus lateralis*, Herbst. No. 4, *Dineutes assimilis*, Kirb. No. 5, *Opatrinus notus*, Say. No. 6, *Copris ammon*, Fabr. No. 7, *Copris carolina*, Linn. No. 8, *Geotrupes excrementi*, Say. No. 9, *Copris anaglypticus*, Say. No. 10, (A) *Canthon chalcites*, Hald. No. 10, (B) *Canthon lævis*, Drury. These two are very similar, but *chalcites* always has a smooth and *lævis* a rough-punctured anus. No. 11, *Parandra brunnea*, Fabr. No. 12, *Pelidnota punctata*, Linn. No. 13, *Tenebrio tenebrioides*, Lec. No. 14, an English species, we cannot undertake to name; it is a *Mycetophagus*, and probably *quadripustulatus*. No. 15, *Philonthus apicalis*, Say. No. 16, *Pirates picipes*, H. Sch. No. 17, *Casnonia pennsylvanica*, Linn. No. 18, *Julus marginatus* (myriapoda). No. 19, *Dermestes nubilus*, Say. No. 20, *Chlænius pennsylvanicus*, Say. No. 21, *Platinus punctiformis*, Lec. No. 22, *Ischyrus*, *4-punctatus*, Oliv. No. 23, *Bembidium posticatum*, Hald. No. 24, *Aphodius fimetarius*, Fabr. No. 25, *Bembidium lævigatum*, Say. No. 26, same as 25. No. 27, *Oodes cupræus*, Chaud. No. 28, *Pterostichus chalcites*, Say. No. 29, *Haltica* ————? No. 30 we are not acquainted with; it must be foreign. No. 31, *Bembidium caudatum*, Lec. For the proper determination of several of them, we are indebted to Dr. Horn, of Philadelphia.

*Guide, etc., p. 134.

DRAUGHTSMAN WANTED.

Coleop. finished to

Botanical Department.

DR. GEORGE VASEY, EDITOR, Richview, Ills.

THE HERBARIUM.

The objects in Nature are so numerous and diversified that it is impossible for any one to retain in the mind a distinct and clear conception of all the species in any one of the departments of Nature. Every Naturalist also knows how difficult it is to describe, by pen or type, clearly and accurately the characters of a species, so that it may be easily identified. Hence the importance, in the different departments of Natural science, of collections or museums of natural objects. For instance, it is impossible to give a learner a clear idea of the nature of granite, limestone, sandstone, or other rocks and minerals without an examination of specimens. Indeed, it may be safely stated that no man can become a good Naturalist without the preservation, in some form, of the objects of his research.

In pursuing the study of Botany, it is of the greatest importance that specimens of the plants examined should be preserved for comparison with other species. We hope many of our readers will commence with the opening of spring to make collections of dried plants, and to aid them in this work, we present a few directions, by following which, we think, they will succeed in obtaining satisfactory specimens.

A very good and convenient press consists merely of two pieces of planed board, each about fourteen by twenty inches, and with two cleats screwed across each board to prevent it from warping or splitting.

Next provide an abundance of paper for dryers; common wrapping paper will do, about twelve by eighteen inches in size; or newspapers folded to about that size will answer. Then we want a quantity of plain white printing paper, of about the same size. Newspapers folded to the proper size will do for many plants, but the white printing paper is best.

Now, how much of a plant shall we take for a specimen? Whenever the plant is small enough to go into a sheet ten by sixteen inches, without much crowding of the parts, take the whole plant while in flower, or what is better, in flower and fruit, when possible, and with the root also, or a part of the root, if large. The principle is to have as fair and full a representation as possible of all the parts of the plant.

The roots, or the bulbs and tubers, of some plants are important characters, and sometimes furnish distinctive marks of great value. When the bulb or tuber is large and bulky, it will be best to slice off longitudinal pieces to reduce it to proper size. Some long and slender plants, as grasses, can be easily bent once or twice, so as to include the whole plant in a single sheet. But where the plant is too large to be used entire, we take a portion—as a branch, with leaves, flowers and fruit if possible.

In some cases we have to take specimens of a plant at different times, in order fully to represent its characters. For instance, some Willows, the Elms and some Maples, develop their flowers, and nearly mature their fruit, before the leaves are fully expanded. In this case we get specimens, first of the flowers and afterwards of the leaves and fruit.

Now, suppose we are ready to prepare a botanical specimen. We first lay down one of the press boards, upon which we place five or six sheets of the drying paper. Next the specimen is to be spread out, as naturally as possible, on the white sheet. Of small plants several specimens may often be placed on one sheet. This sheet, containing the specimen or specimens, is next to be placed on the layer of dryers, and five or six sheets more of dryers to be placed above it. Now, if we have any more specimens, we may fill another white sheet and place on more dryers, and so alternate them until we have in press all the specimens we wish. Then we place the other press-board on the top of all, and upon it we place a heavy weight, not generally less than fifty pounds, and for most plants, especially when there are many in the press, a hundred pounds will not be too much.

The usual custom is to leave the press in this state for about twenty-four hours, then remove the dryers, which have by this time become damp with the moisture absorbed from the plants, and replace them with fresh ones; then reapply the weights and leave them for another day, repeating the change of dryers daily until the moisture is entirely removed from the specimens, which will usually require about one week. Some succulent plants will require a longer time. The damp papers may be dried and prepared for use again by half an hour's exposure to a hot sun, or if necessary they are to be dried by the stove.

It frequently happens that, after a lot of plants have been in press for one, two, or more days, we want to introduce more specimens. In this case we should separate the fresh ones from the others by intervening a piece of oiled cloth, or oiled paper. When dry the specimens are to be carefully put away in the Herbarium.

We shall be surer of making good specimens, and shall make them in less than half the time, if we change dryers twice a day. With some delicate plants this is essential, in order to preserve the colors of the flowers.

It will be remarked that this process involves a considerable amount of labor. True, it does; but it will pay. No person can become an accurate practical Botanist without an Herbarium; for well prepared specimens may be kept any length of time, and are always ready for examination and comparison. Besides, a good Herbarium is a source of pleasure. What is more suitable for a place on the parlor table than a good Herbarium, even though it contain only a score or two of plants? How much enjoyment and pleasure may be derived from such a collection? The Ferns and Mosses especially make beautiful specimens, well worthy a place in every lady's cabinet of curiosities.

THE COMMON VIRGIN'S BOWER.

(*Clematis Virginiana*, L.)

This is a perennial climbing vine, which might be introduced into our gardens with good effect. Its flowers are not as showy as those of some foreign species, but its greatest novelty consists in its copious clusters of feathery tailed fruit, which hang on the vine late in the season and are conspicuous objects of attention even when seen in a wild state. The Atragene (*Clematis verticellaris*, D. C.) is a smaller species, with rather large and showy single flowers, succeeded by single heads of tailed fruit. It is a rare species, occasionally found in rocky woods, and would be a pleasing addition to our cultivated list.

In every part of our country there are native plants that are as worthy of cultivation as the foreign ones which are commonly found in gardens. Every large district of country has some species which are peculiar to itself, and this fact furnishes an opportunity for exchange between the cultivators of different sections. Only a small number of our native plants have been introduced into our gardens. We have an immense variety to select from, and a little care in their management would improve their size and beauty, and probably in some cases produce that condition which is generally sought for by florists, namely, the tendency to produce double flowers.

ERRATA.—Page 183, column 2, line 21 from bottom, for "Fig. 113" read "Fig. 115." Page 188, column 1, line 16, for "*Cersis*" read "*Cercis*."

PULSATILLA.

(Fig. 135.)

American Pulsatilla or Easter Flower. (*Anemone patens*, L., var. *Nuttalliana*, Gr.)

The genus *Anemone* is pretty well known, in some of its species, all over our country. The name is derived from a Greek word signifying wind—given, as some think, because many of them bloom in the windy days of spring. The genus has representatives in all the principal divisions of the globe. In the Northern States we have eight species, including *Pulsatilla*, which until recently has been considered a distinct genus. It differs chiefly from other species of *Anemone* in having long feathery, or tailed seeds, as in Clematis, while in *Anemone* proper the seeds are short, and without the tailed appendages.

We present a figure of our American *Pulsatilla* (Fig. 135), which is a variety differing little from the European *Anemone patens,* and is distinguished as the variety *Nuttalliana,* Gr. It grows somewhat sparingly on gravelly hills, or banks, in northern Illinois, in Wisconsin and Minnesota more abundantly, and thence westwardly to the Rocky Mountains. The flower (Fig. 135, *a*) usually makes its appearance early in April. It is of pretty large size, and of a bluish-purple color, varying to a light blue. The flower has not the usual two sets of floral leaves, *i. e.*, calyx and corolla, but only the external set of sepals, which, however, are petal-like in texture and color. There are usually six of these sepals, from one to one and a half inches long, oblong, and covered externally with scattered silky hairs.

The flower blooms before the development of the leaves, and at first seems to be closely surrounded by the involucre of finely dissected leaves which is just below it; but it gradually pushes itself up on a stem, which finally becomes two or three times as long as the portion of the stem below the involucre (Fig. 135, *b*). Finally the sepals and stamens drop off, and a head of fifty to eighty seeds, with fine silky tails an inch and a half long, is matured. During this time, also, the radical leaves (Fig. 135, *c*) are developed. The whole plant is at first covered with silky hairs, which mostly wear off with age.

In the north of Europe this plant and a nearly allied species, *Anemone Pulsatilla,* are well known as the Pasque flower, or Easter flower, and they are often used to decorate the churches during Easter. The Pulsatilla has also attained great celebrity as a medicinal plant, especially in homœopathic practice.

In tropical countries many species of plants live entirely upon what they obtain from the air. They usually grow upon trees, but not in the manner of parasites, because they do not insinuate their roots into the tissues of the tree, or plant, and draw from it its juices. These are called Epiphytes, or air-plants. It is stated that in the island of Java there are over three hundred species of *Orchidaceous* plants of this character. The Spanish Moss of our Southern States, which is seen hanging in long, tangled threads from the branches of trees, belongs to this class of air-plants. Many lichens growing on bare rocks are true *epiphytes,* as is also a species of lichen (*Parmelia mollinscula,* Ach.) which grows on the arid plains of the Rocky Mountain region. Parasitic plants differ from air-plants in not only growing upon other plants, but in drawing their sustenance from them. The Mistletoe strikes its roots into the branch on which it grows so thoroughly as to be inseparable from it.

VEGETABLE CELLS.

BY DR. FELIX SCHAAN, CHICAGO.

PART I.

In our microscopical investigations we meet with two kinds of objects—those originating in the mineral kingdom, as crystals, their polarization, decomposition, etc.; and those having connection with organic life. The latter are classed in two grand subdivisions, viz., the Vegetable and Animal Kingdoms. In both we find one common ground form of being, the cell. This is the foundation-stone of the entire Vegetable and Animal Kingdoms, and is a subject of overwhelming importance. We propose at this time to discuss the vegetable cells, in their different phases of generation, life and death.

The vegetable cell is composed of an outer coat of cellulose, including closely another of nitrogenous matter, called the primordial vesicle. This contains certain substances, as starch, fat, crystals, chlorophyl, granular matters, gas, and a nucleus called cytoblast, which contains one or more nucleoli. Let us pass in review all these parts, in order to have an acquaintance with the whole cell.

1. *The Cellulose.*—The cellulose pure is white, transparent, diaphanic, insoluble in water, in spirit of wine, ether, or the fixed or etheric oils. Feeble solutions of acid exert but little action upon it, even by boiling; it is the same with feeble alkaline solutions. The resistance which the cellulose opposes to these reactives varies, however, with its cohesion; the newly built cellulose alters easier than that of older formation.

Concentrated sulphuric acid ($S\,O^3$) transforms the cellulose into a substance called "dextrine." Nitric acid ($N\,O^5$) transforms it into an exceeding combustible and explosive substance known under the name of "cotton-powder." Boiling nitric acid transforms cellulose into oxalic acid. Acetic acid does not attack the cellulose. The cellulose does not change its color by the addition of an aqueous solution of iodine; but when the sulphuric acid has commenced its disaggregation, the iodine gives it a beautiful blue hue.

This chemical reaction is one ot those we use to prove the existence of cellulose under the microscope. The chemical composition of cellulose is represented by carbon ^{12}, hydrogen ^{10}, and oxygen ^{10}.

Some may wonder how we are able to give these facts on studying a membrane not thicker than one ten-thousandth part of an inch. We state these facts by way of isolation—by taking divers parts of vegetables and submitting them successively to different chemical reactions which effect a destruction of all foreign matters adherent to the membrane in question.

There is no difficulty in showing you this part of the vegetable cell. Take a potato, cut it, and take from the cut surface a very thin slice on an object-glass; cover it with a covering glass plate, and add a drop of water. You will remark on the edges of the slice many cells, in some parts only a portion, rent, lacerated, and out of connection with the adjacent cells.

If you have any doubt of that being a cellulose membrane, you add some solution of Iodine. Instantly you see the starch in the cell colored a deep blue. The membrane remains transparent, white as before. Add a drop of sulphuric acid and you will see, after a while, the membrane also take a blue hue, but not so intense by far as the starch bodies near by. The parts near the corner where you let enter the sulphuric acid are colored first, and the color advances gradually in the other direction.

I made some fine slices of the root of *Valeriana officinalis*. In putting them between the glass plates I could not distinguish any cellulose membrane, or any indication of it. It was because the salts spread through the cells, and the incrustations in their walls rendered the membrane opaque. In boiling the preparation, the water took so much of the soluble salts away that the cellulose membranes could be seen very clearly. This boiling can be performed in any vessel; but for our purpose it suffices to add some drops of water to the object glass, and hold it for an instant over the alcohol lamp. The jumping up and down of the covering glass-plate denotes that there is steam formed, whose expansive power is utilized in the locomotive.

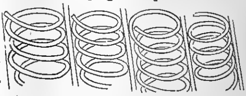
Now the cellulose membrane is degarnished enough to be observed, and we can try the same experiment with the iodine and sulphuric acid as alluded to before. It is indifferent which of the two you add first. I boiled the valerian root in water containing a few drops of sulphuric acid, and the membrane grew free to a greater extent, because the sulphuric acid is a strong dissolvent for organic as well as for inorganic salts. When you put this slice under the microscope, and add a drop or two of iodine solution, you remark easily the growing of the blue color at the margins before white. I tried the same experiment on a fungus which luxuriated upon an animal matter, but with a negative result. A fungus growing in a sugary solution should be carefully washed, because the sugar, being transformed by sulphuric acid into dextrine, can take the blue color by adding iodine. The cellular membrane of these two vegetables (potato and valerian) is smooth, without any pores.

The successive coloring of the contents of an integer cell from the side from which the reactive comes, demonstrates that it is only by the law of Osmose, and not through pores or other holes in the wall that the coloring is effected.

We find often at the inside of the cuticle of cellulose, layers of different form, thickness and arrangement. These layers have sometimes the form of a circle, sometimes of a spiral, sometimes of large deposits covering more or less the entire surface of the cell.

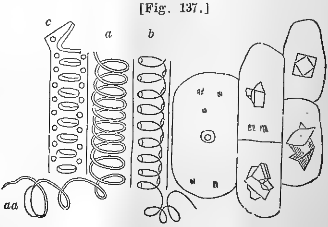
When the cell contains one or more rings, it is called the *cellula annulifera*, or ring-bearing cell. We find these mixed with spirals in a transverse cut of a leaf of Hyacinth (Fig. 136). When the two ends do not grow together, then the layer inside the cell takes the form of a spiral; this spiral can run from the left to the right, or from the right to the left. The cells containing the spiral are called fibre cells, when the fibres are clearly separable from the cell wall. A transverse cut of Hyacinth shows very distinctly these spirals. And you can also distinguish some fibres running from right to left, and one running in the contrary direction. The same can be observed in a few cells out of the pith of Geranium.

[Fig. 136.]



Transverse cut of Hyacinth leaf.

[Fig. 137.]

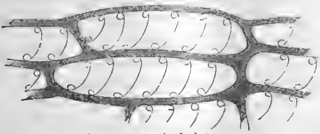


Pith of Geranium

In this example I had rent the spiral out of the cell, and so I could study it more closely. I found it an elastic substance without hole in the interior, the breadth being everywhere the same. In one part I distinguished that the fibre-ribbon was split in the middle (Fig. 137, *aa*) but soon coming together again, leaving a kind of button-hole.

In the fibrous cell adjacent (Fig. 137, *b*) I remarked that, at the borders of the cell where the fibre-ribbon passed from above to below, there was a little white space (Fig. 137, *c*), the effect of the interference of the light. I followed the spiral, and found at one end, where it was rent out of the cell, that it was also an entire fibre, and I could see that the white spots at the twining was not occasioned by a pore or a hole in the wall of the cell. This observation was very interesting, because it gave me the opportunity of explaining such white spots at the ends of a tender line in the cells of a moss (*Sphagnum fimbriatum*), which I was unable to do before (Fig. 138).

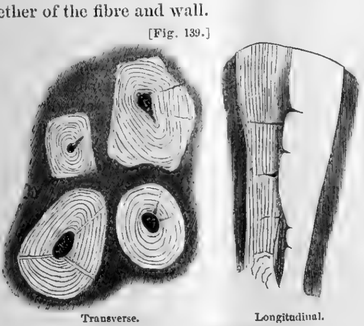
[Fig. 138]



Sphagnum fimbriatum.

This tender line is nothing else than a spiral. This fibre could not be isolated from the cellulose, but it adhered very fast to it, and broke just at the same place as the cellulose, as you can remark in the lacerated cells of the edge of a slice. That might be considered as the transition to the porous cells (*cellulosæ porosæ*), in which the fibres are so grown together as to appear like a continuous membrane beset with little pores. Close by the fibrous cells you can find them in the pith of Geranium (Fig. 137, *c*). It presented itself in the shape of a ladder, the pores are horizontally disposed at equal distances from each other; in the middle of each pore you can see a transverse line dividing it into two halves—an effect of interference of light. In the thickness of the wall of the cell at both sides, and corresponding to the space between the pores, we remark a swelling of the cellulose; this is the result of the growing together of the fibre and wall.

[Fig. 139.]

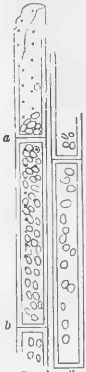


Transverse. Longitudinal.
Liber cells of Cinchona calisaya.

When the inside layers are deposited merely on the entire surface of the cellulose wall, then we have a successive growing of the wall in a regular way, depositing ring upon ring, spiral upon spiral, porous layer upon porous layer; or the layers are deposited irregularly—the first is mostly the case.

A transverse and a longitudinal slice of liber-cells of the Peruvian bark (*Cinchona calisaya*) gives us a splendid illustration of this. You can pursue the pores through the entire layer, which has the aspect of a series of boxes inclosing one another. (Fig. 139.)

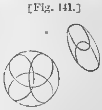
[Fig. 140]



Starch cell Sarsaparilla.

In the starch-cells of the root of Sarsaparilla (*Smilax sarsaparilla*) the pores are deposited with regularity. I remarked that, by cutting the slice, the pores near the edge did not rend; and by adding iodine, the starch inside the integer cell (Fig. 140, *b*), attached with its top to the lower end of this lacerated cell, took its blue color merely in accordance with the law of Osmose. The starch granules near the top (Fig. 140, *a*), where they are separated from the contact of the iodine by *two* membranes, colored first and more intensely, because the capillarity sent a large amount of iodine in that direction.

[Fig. 141.]



Compound starch cell Sarsaparilla.

HOW TO STUDY THE GRASSES.

The study of the grasses is attended with some difficulty on account of the smallness of the parts composing the flowers, and is undertaken by very few, even of those who study with some care the more conspicuous flowering plants. But for those who will have the patience to attempt their investigation, Nature spreads out an open and inviting field, and the explorer will be rewarded by discoveries of as great interest as in any other department.

Let us notice some of the principal parts, or organs, entering into the flower structure of the grasses. The flowers of grasses are sometimes in spikes, as those of Timothy or Herd's-grass, and sometimes in loose, open panicles, as those of Red-top. Each spikelet, or smallest subdivision of the spike or panicle, whether consisting of a single flower or of a number of flowers, has commonly a pair of outer husks called glumes.

Each individual flower is composed of two inner husks or scales called paleæ, three stamens (each consisting of a thread-like stem or filament), a pollen-box or anther, and a pistil, composed of the germ and two hairy or feathery styles. The outer pair of glumes is sometimes wanting, and in some cases one of the inner pair is either absent or imperfect.

It is well to begin the study of grasses by examining first the structure of some of those having large flowers, as the common Oat (*Avena sativa,* L.) Here if we take one of the smallest spikelets, we find first a pair of large husks or glumes, one of them at the bottom rather folds over the other, and is affixed to the stem or rachis a little below it, hence it is called the lower glume; the other is called the upper glume. Just within these glumes will be seen two or three flowers, in each of which we may observe the two palets, and, if the specimen is collected in flower, we will find the stamens and styles, but if the ripe oat is examined we shall find within the palets only a grain; or, indeed, one of the two or three flowers may be sterile or imperfect.

A wild grass (*Stipa spartea,* Trin.) growing on the native prairies and plains of the West, and sometimes called Wild Oats, or Porcupine grass, on account of the slender, twisted awn or bristle, four to six inches long, which encloses the seed, has very conspicuous glumes, one and a half or two inches long; but very few of our grasses have flowers of such magnitude, while in some species the flowers are less than one line in length.

After acquiring familiarity with the floral organs in some of the larger specimens, the learner will have little trouble, with the aid of a common lens, and of the excellent figures in Gray's Manual, in getting an acquaintance with any of the common grasses. We trust our readers will improve the coming season in an investigation of this subject.

POISONOUS PLANTS.

"At Walcott, in this county, on Monday evening, Harry, aged 5½ years, son of Dr. T. Byrnes, and Willie, aged 7 years, son of Mr. Barche, died from eating the poisonous root known as wild parsnip or Hemlock. The children were playmates, and about six o'clock took a walk along the railroad track, where they discovered the plant, of which they ate. The first intimation any one had of anything being wrong was about seven o'clock, when little Harry came home and told his mother that his playmate, Willie Barche, was down there (pointing to the railroad) sick. He said, 'Willie staggers like a drunken man, and he is sick, Mam, he is real sick; and I feel sick, too.' Dr. Byrnes, who was at home, overheard the remark, and, on looking, saw Willie lying down upon the ground. He immediately requested Mr. Peck, station agent, to bring the child to the house. This was done, but the poor little fellow was then in a state of collapse, and soon went into violent convulsions, and died in half an hour. Mrs. Byrnes, when apprised by her little son that he was sick, consulted her husband, and a strong emetic was given the child. Being asked what he had eaten, he said, 'Only two little roots about as big as my finger.' The child continued to grow worse, and in a short time was seized with convulsions, and, despite all remedies, died at midnight."—*Davenport Gazette,* April 20.

It is now an appropriate time to give a word of warning respecting poisonous plants. Every spring we find such accounts as the above in the public prints, of cases of poisoning from the use of roots which are mistaken for those of esculent vegetables.

A few years ago, we knew a strong, healthy young Norwegian, who, having found some roots just beginning to develop leaves, ate two or three of them, under the belief that they were parsnips. In an hour or two he was seized with pain and vomiting, and before medical aid was procured he was dead. The roots were those of the Spotted Cowbane (*Cicuta maculata,* L.), a plant which occurs all over the country in low moist grounds, and has been the occasion of many cases of poisoning.

Two years ago, several children near Centralia, Ill., were poisoned from eating the roots of another plant, which grows in the southern part of the States of Ohio, Indiana and Illinois, in similar situations with the preceding, and is botanically called *Eulophus Americanus,* Nutt. It has no definite common name so far as we know.

These two plants belong to the Natural Order *Umbelliferæ,* or to the same family as the Caraway, Parsley, Carrot, Parsnip, &c. It embraces many poisonous plants, among them the Poison Hemlock (*Conium maculatum,* L.), the juice of which, it is supposed, was employed by the ancients in the execution of criminals.

Children should be cautioned against eating any wild roots without the sanction of those who are acquainted with them and know what they are. We shall hereafter give some illustrations of these poisonous plants.

Western Botany.—A large portion of the native vegetation of the States west of the Mississippi, and particularly of the great Plains of Kansas, Nebraska and Colorado, is not described in the common Text-books of Botany. Hence our friends in those sections will meet with difficulty in becoming acquainted with the plants they meet with there. The names and descriptions of such plants are contained in Pacific Railroad Reports, and in published proceedings of various scientific societies.

[Fig. 142.]

The Flowering Dogwood.

THE FLOWERING DOGWOOD.

(*Cornus florida, L.*)

There are many kinds of Dogwood (*Cornus*), the most of which are shrubs varying in height from five to ten or fifteen feet, and distributed over nearly all parts of our country. But the most attractive and showy of all the Dogwoods is that species botanically called *Cornus florida*, L. It is a small tree, growing from fifteen to twenty-five or thirty feet high, having a pretty wide range of latitude, from 47° N. to Florida, being rare, however, in the northern latitudes. Its natural situation is in rocky woods, and on the borders of streams.

It is a very conspicuous object when in flower, from the profusion of large white blossoms, or rather what appear to be blossoms, for the apparent blossoms are not really such. The true flowers are very small, and clustered together in a small head. Each of these minute flowers has all the parts proper to a perfect flower, calyx, corolla, stamens and pistil. Immediately beneath the cluster is developed four large white leaves, looking like petals, but really forming what is called an involucre. These involucral leaves are inversely heart-shaped, and about an inch and a half long. At a distance they look like the proper petals of a single flower, while the small head of true flowers which they surround looks like the central organs of a flower. A close examination will readily detect the true nature of these parts.

The wood of the Dogwood is very close-grained, hard, capable of an excellent polish, and useful for the manufacture of many articles requiring durability and firmness of texture. The bark of the tree is bitter, and has long been known and employed as a substitute for, or adjuvant of, Peruvian bark and quinine in the treatment of ague and malarious diseases.

The tree is well deserving of cultivation from the showy appearance of the snow-white flowers, or floral appendages (Fig. 142), which contrast finely with the lively green of the foliage, and from the bright red berries which succeed the flowers.

OUR CULTIVATED GRASSES.

The grasses which in this country are cultivated for pasturage and hay-making, are chiefly Blue-grass (*Poa pratensis*, L.), also called June-grass, Red-top (*Agrostis vulgaris*, With.), and Timothy, or Herd's-grass (*Phleum pratense*, L.) Several other species are occasionally found in lawns and orchards, and an annual species called Millet (*Setaria italica*, Kunth), is somewhat extensively grown for hay or fodder.

In some portions of the country Blue-grass has acquired an extended reputation as a pasture grass. In Kentucky, Ohio, and some other Western States, it is considered the most valuable of all grasses for pasturage. There has been much discussion during several years past as to the real botanical name of the Kentucky Blue-grass, some contending that it was the *Poa compressa*, which is also called Blue-grass, and which, in fact, is often found growing with *Poa pratensis*. The latter has an upright, round stem, or culm, while the former has a reclining and flattened stem, We think there is little doubt among botanists that the June-grass of the Northern States is also the Blue-grass of Kentucky, varied only by differences of soil and climate. The genus *Poa* includes a number of other species, which have more or less value as forage plants, the most important of which is, probably the Fowl Meadow-grass (*Poa serotina*, Ehrh.) This is found as a native grass in many parts of the country, forming, indeed, a considerable proportion of the grass of sloughs and wet meadows in Northern Illinois and Wisconsin. Though somewhat coarse, it is a very productive and useful grass.

Red-top (*Agrostis vulgaris*, With.) is extensively employed in the Northern States as a pasture grass, especially on low, damp grounds. In Pennsylvania it is called Herd's-grass, which name in the Northern States is applied to quite a different grass. Red-top is native both in this country and in England, where it is called Bent-grass. Two other nearly-related species, the White Bent-grass (*Agrostis alba*, L.), and the Brown Bent-grass, (*Agrostis canina*, L.) are occasionally found in meadows mixed with common Red-top, and they also are native in some localities in this country. All the species of *Agrostis* have one-flowered spikelets, in open panicles. Red-top has its name from the reddish color of the flowers and flower branches, which color is very peculiar and distinctive when a large quantity, or a field, is seen at once. The stems are erect, round and smooth, and the roots creeping.

As a grass for hay-making the Herd's-grass, or Timothy (*Phleum pratense*, L.), is more extensively employed than any other. Its solid stems, and tall, vigorous growth, give a large product of highly nutritive hay. Its flowers are arranged in a compact, cylindrical spike, usually three or four inches long. The spikelets are single-flowered, of two stiff-pointed glumes, including two much smaller and shorter palets. This grass has been introduced from Europe, where it is native, and also extensively cultivated under the name of Cat's-tail grass.

On the high mountains of New Hampshire, and also on the Rocky Mountains, we have a native species closely related to the Timothy, viz.: *Phleum alpinum*, L., or what might be called the Alpine Timothy. In Europe there are also several other species belonging to this genus, none of which, however, have been cultivated.

THE HONEY LOCUST.

(*Gleditschia triacanthos*, L.)

The Honey Locust is a well known tree, principally of the Western and Southern States. It is one of our largest forest trees, the trunk frequently attaining a diameter of three or four feet; but, from its habit of early dividing up into large branches, it does not attain as great height as many smaller trees. It usually forms a broad, open head, with a beautiful light-green foliage, which waves gracefully in the summer breeze.

Its trunk and limbs are usually beset with numerous horrible spines, or thorns, from three to six inches long, each of which has commonly two branches, whence the specific name *triacanthos*, or three-thorned. These thorns, however, are not constant, as trees are occasionally found which are entirely smooth. Some have supposed these were a different species, but they are in all other respects like the thorny kind, and the seed of either will produce thorny and thornless trees.

The favorite locality of the Honey Locust is in bottom lands, or following the course of small streams. It belongs to the Pea family (Natural Order *Leguminosæ*), but not to the same section as the Black Locust, which has true papillionaceous flowers. Its relationship in the Pea family would not be suspected from the appearance of the flowers, but its pinnate leaves and long pods, or true legumes, easily identify it.

In its flowering habit it is polygamous—that is, the fertile and infertile flowers are either separate or variously mixed on the same tree. The flowers are small and inconspicuous, in short spikes, proceeding from the axils of the leaves.

The fertile ones produce flat, twisted pods, a foot or more in length, and an inch and a half broad, and containing twenty or more pretty large, flat seeds. The pinnate leaves, four to six inches long, are made up of about ten pairs of small oblong leaflets, which are nearly entire on the margin. The pods contain a sweetish pulp, which is said to be employed in some of the Southern States in fermenting a kind of beer.

The tree is a vigorous grower, with a pretty dense, tough-grained wood, which makes excellent fuel. It is not much in request as an ornamental tree, perhaps on account of its formidable thorns, but has been employed to make hedges, and by some is thought to be superior for that purpose to the Osage. It has also been recommended for timber plantations.

THE WOODY COMPOSITÆ.

Perhaps no family of plants is more numerous in species than that of the so-called Compound flowers (*Compositæ*).

In all that part of the country lying east of the Mississippi there is not a shrub or tree belonging to this family. Some kinds, as various species of Sunflower (*Helianthus*), produce annually a large and heavy growth, but it invariably dies down to the ground at the approach of winter. The roots of many are perennial, but nothing above ground survives a season's growth.

It is not so, however, with several kinds of *Compositæ* in the region of the Rocky Mountains, and particularly in the great basins of the western slope. These are various species of *Artemesia* and *Linosyris*, all generally classed under the name of Sage brush; and they form a prominent and distinctive feature of the Plains, and in some measure by their woody growth compensate for the absence of trees.

The largest and most common Sage brush is the *Artemesia tridentata*, Nutt. It is very variable in size; on dry upland plains not usually over two or three feet high, with a trunk two or three inches in diameter. In valleys and moist ground it often attains a height of eight to ten feet, with a thickness of as many inches. Usually there are a number of stems spreading out from one root. The wood is light and porous, somewhat resembling cedar, and it burns readily even in a green state, as also do the leaves, with a pleasant balsamic fragrance. It is the main dependence, for fuel, of immigrants and travellers on the Plains west of the mountain ranges. It has no resemblance to our cultivated Sage-plant, except in its fragrance, and belongs to an entirely different family. Its annual growth is very slow. We have often cut bushes of moderate size which indicated forty or fifty years' age, and undoubtedly many of them continue to grow for a century.

Another species, the *Artemesia cana*, Pursh., is seldom found away from rich moist valleys. It sends up more numerous stalks from one root, *i. e.*, it grows in bushy clumps of twenty or thirty stalks, which are each about an inch in diameter.

Still another species is the *Artemesia arbuscula*, Nutt. This is very dwarf in habit, seldom growing over a foot high, but often covering hundreds of acres on low mountain slopes.

The bushes of *Linosyrus* are quite similar in general habit to those of the *Artemesia*, but do not grow as large. There are also several species of that genus.

NEW BOOK.

THE AMERICAN BOTANIST AND FLORIST. By ALPHONSO WOOD, A. M., author of the Class Book of Botany, &c. A. S. Barnes & Co., New York and Chicago.

This is a handsome, well-printed volume of nearly 600 pages, possessing some features of great merit. The part devoted to structural and physiological botany is an example of great condensation, and is profusely illustrated. The definitions are generally very clear and concise. In some instances, we think, technical names are unnecessarily employed, as for instance, *pleurenchyma* instead of *fibrous tissue*, and *trachyenchyma* instead of *vascular tissue*. Where English words will convey the idea intended, we think they should be employed in preference to foreign ones; thus *head* is a better word than *capitulum*, and *cluster* is to be preferred to *glomerule*, etc.

The portion of the volume devoted to descriptive botany professes to record the characters of nearly 4,000 species of the native and cultivated plants of the United States east of the Mississippi river. The introduction of greenhouse exotics is, we think, carried too far; for instance, we have given us fifteen species of Begonia, a genus of which we have no native representative. As an accommodation to city classes, whose acquaintance with plants is mostly limited to the cultivated exotics, this may be well enough, but for students wishing to study the productions of their own country, we think this matter is superfluous, and that its space would be better filled by expanding the descriptions of our native plants.

FERNS AND MOSSES.—The Ferns and Mosses are beautiful objects and well deserving the study of young ladies. Good specimens are finely adapted to parlor collections for ornament as well as for study. There are about sixty species of ferns in the Northern States. Many of them are very delicate and beautiful. The fructification is generally in small dots or lines on the back of the leaves.

NOTES FROM CORRESPONDENTS.

Field and Meadow Mosses.—The species affecting these localities, and often by their abundance doing great damage to meadows, are *Bryum argenteum*, Lin., *Barbula unguiculata*, Hed., *Archidium Ohioense*, Sch., *Phascum cuspidatum*, Schr., *Phascum alternifolium*, Brid., and *Phascum nitidulum*, Schimp. Several others are occasionally found in certain localities in less numbers. *Hypnum polymorphum* on clay lands is sometimes quite abundant and injurious. *Phascum triquetrum* is rarer. *Bryum cæspiticum*, L., *Atrichum augustatum*, Bean, *Funaria flavicans*, Mich., and *Hypnum salebrosum*, Hoff., are rarely found in such situations. *Weissia viridula*, Brid., in some clay meadows is also found sparingly, and in very low swampy places, *Hypnum riparium* and *Hypnum radicale* frequently abound; but excepting the first six species little damage is sustained to the grasses by their presence. *Bryum argenteum* and *Barbula unguiculata* are specially obnoxious not alone in these situations, but in gardens and house-grounds where weeds are kept down, having the advantage of growing without much heat; in fact, flourishing most luxuriantly when phenogamous plants are entirely at rest in the winter, they soon possess themselves of the whole territory, and finally choke out many herbaceus plants, and do great mischief to garden shrubbery and even trees. Underdraining would to some extent diminish the evil, but as all mosses grow chiefly during the winter and spring months, when moisture almost continually abounds, no satisfactory remedy will probably ever be applied for this particular evil to agriculture and horticulture. E. HALL.

Velvet-leaf (*Abutilon Avicennæ*, Gaert.)—The Indian Mallow, or Velvet-leaf, often so called, and also locally Stamp-weed, from a use formerly of printing butter with its pods, is an annual East Indian plant of the Mallow family. It is a vile weed, already well established in numerous localities in the West, as well as in the older portions of this country. Public attention, if not legal enactments, should be directed without delay to some means of limiting its dissemination, or confining it to its present areas: eradication where established is not practicable, the seeds being apparently imperishable under all conditions to which time can expose them. The writer having carefully attended a small locality for sixteen years, finds the seeds that ripened probably sixteen years ago from a single plant annually making their appearance. The spread of the plant is not necessarily rapid, nor difficult to check. An instance occurs here, where the plant has grown for eight or ten years in a neighbor's garden almost without hindrance, and has not yet crossed to an adjoining field, with only a fence and hedge of weeds between; but the plant, nevertheless, is rapidly extending its areas in the rich cultivated lands all over the West. Farmers are not aware of the pernicious character of the weed or the detriment their farms are subjected to from its presence on them. Fifty per cent. depreciation in intrinsic value would probably be below rather than above the average loss in worth of farms stocked with it. I have seen farms in Central Illinois abandoned apparently on account of the impracticability of profitable cultivation, it being more profitable to cultivate new lands than to own and cultivate farms infested with it; but this easy method will not long be available. Those who have it on their farms cannot be too vigilant to prevent further dissemination, and those few who are so fortunate as to yet be free from it, cannot use too much watchfulness to keep it off. The plant, like most tropical or subtropical plants, has a wonderful capacity of adapting itself to the situation. It only germinates with a high temperature, and when this and moisture, and other requisite conditions are provided, it commences operations without regard to time or seasons, but is never caught. Suiting itself to the circumstances surrounding it, it invariably accomplishes the object of its existence, *i. e.*, matures seeds. It is a rapid grower, and apparently an exhaustive feeder, and no foreign or native weed is destined to work half the evil to agriculture if permitted to generally disseminate itself through the rich prairies of the North and West.

ATHENS, Ills. E. HALL.

ANSWERS TO CORRESPONDENTS.

Plants to Name.—*Mrs. B. S. Lake, Colorado.*—More of those nicely prepared specimens of Rocky Mountain plants. No. 6 is *Pentstemon glaber*, Ph. The genus *Pentstemon* is represented by only three species east of the Mississippi; but westward the species become very numerous, and many of them have large and conspicuous flowers. This species is very ornamental, and may be cultivated with perfect success. It is nearly related to the Fox-glove family. No. 7 is the Rocky Mountain Flax (*Linum perenne*, L.) This, as its name indicates, is a perennial species of flax, growing from Missouri to the Pacific, and also in Europe and Asia. It has a slender, branching stem, two to three feet high, and rather large, bright-blue flowers. No. 8 is *Gilia aggregata*, Spreng. The Gilias belong to the same Natural Order as the Phlox, and are closely related to that genus. Many of them are very showy. This species has narrow, trumpet-like flowers, one and a half inches long, in loose clusters along a tall, slender stalk. They vary in color from white to bright scarlet. No. 9 is *Castilleia integra*, Gr. This may be called the Entire-leaved Painted Cup. It grows at considerable elevations on the mountains, and with its bright scarlet bracts lights up the mountain sides. Two or three other species there join with it in giving variety and beauty to the scenery. No. 10 is the Alpine Vetch (*Astragalus alpinus*, L.), a very pretty and delicate plant, growing on the borders of cold mountain streams. It is also found on some mountains in New England, and in Europe. No. 11 is *Potentilla pennsylvanica*, L. This occurs under a variety of forms at all elevations in the mountains and valleys, and with its grayish-white leaves and yellow flowers has a pleasing appearance. It is doubtful about its ever having been found in Pennsylvania, as would be inferred from the specific name, but it occurs in a few places in New England.

Chas E. Billen, Philadelphia.—Your plants are as follows: No. 1, an exotic Spirea; we have not the means of determining the species. No. 2 is our beautiful native Yellow Lily (*Lilium canadense*, L.) No. 3 is called Knawel (*Scleranthus annuus*, L.), a weed introduced from Europe. No. 4 is the Butterfly-weed, or Pleurisy-root (*Asclepias tuberosa*, L.) No. 5 is a kind of Milkwort (*Polygala fastigiata*, Nutt.) No. 6 is Slender Gerardia (*Gerardia tenuifolia*, Vahl.) No. 7 is one of the Blazing Stars (*Liatris scariosa*, Willd.), a beautiful plant, as are the other species of this genus, and well deserving cultivation. No. 8 is the showy Toadflax (*Linaria vulgaris*, Mill.), a troublesome weed in many places. No. 9 is the Hardhack (*Spirea tomentosa*, L.), a handsome shrub. No. 10 is an incomplete specimen of what appears to be *Cynthia virginica*, Don. These specimens are mostly well preserved, but some of them are on too small a scale, not fully representing the species.

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Entomological Department.

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GREAT DISCOVERY—CURCULIO EXTERMINATION POSSIBLE!

The importance of this subject, the demand for prompt and persistent action, and the absolute necessity of arousing every peach, plum and stone-fruit grower to destroy the Curculio, have led the editor of the *Herald*, as Secretary of the St. Joseph Fruit-Growers' Association, to issue this extra. Not a single day should be lost, for with united action 500,000 Curculios may be killed in a single day.

There is no doubt on this point. This morning Hon. John Whittlesey called at the *Herald* office and stated that on the 14th inst. he killed 2,715 Curculios about the roots of 200 trees, and on the 15th, in four hours on the same trees he killed 1,500 by actual count.

Mr. Whittlesey also stated that Mr. Ransom, Mr. Bonelle and himself had in five hours killed upwards of 5,000 Curculios in a portion of three small orchards. That he had himself alone, in two days of eight hours each, killed one-half more Curculios than were ever taken by three men with the old fashioned sheet in a week. Mr. Whittlesey is one of the most successful and scientific fruit-growers of St. Joseph, whose word is a bond; but he said, "Do not believe me; go to Mr. Ransom's orchard and see for yourself."

Entering Mr. Ransom's orchard, the editor met Dr. Lyman Collins coming out. Dr. Collins is widely known for his successful peach culture.

"Well, Doctor, is it a success?"

"Most assuredly. I tried the experiment on eight of my trees in the evening, and the next morning took 104 Curculios. I am going home to bug my whole orchard in this manner."

Wm. B. Ransom, the discoverer of the new method of exterminating the Curculio, was found on his knees in the back of his orchard examining his Curculio traps. This was at 10 o'clock A. M., and he had already killed 1,357 on 300 trees. The editor stooped down and lifted up a corn cob not six inches long, and found and killed seven Curculios. There is no doubt whatever, that the long desired means of exterminating the Curculio is discovered.

Such is the burden of a little two-column *extra* to the St. Joseph *Herald,* which Mr. J. E. Chamberlain, editor of that paper, and Secretary of the St. Joseph Fruit-Growers' Association, sent to us just as our last number was going to press. The subject is of such importance that we can forgive, in an editor, the somewhat sensational heading.

The following account of the method employed we soon afterwards received from the discoverer himself:

Editor American Entomologist : As you are scienced in the matter of Bugs, it may be of some interest to you, and of practical importance to fruit-growers, to know that the Curculio—that pest of all stone fruits—can easily be destroyed, as I am now practically demonstrating.

Last year I discovered that they gathered in pairs on the trunks of the peach trees, where the main branches diverge, and on the under side of the limbs, around the knots and black bark. I determined to watch their movements this year, and learn more of their natural habits, and see if there could not be some more speedy, effectual, and less expensive mode of destroying them than has hitherto been practiced.

Some three weeks ago I examined my trees (peach, plum and cherry) but did not find any. The first of May brought warm days, and the same degree of warmth which expanded the blossoms and the foliage, roused the Curculio to activity in this latitude. After two or three warm days, I went (May 4th) and closely examined my trees, and found small numbers of the little pest on each tree. None were found copulating. The next day was warm, and I found a few in pairs. Next day it rained a little, and turned cold. During the cold days and nights the Curculio stopped feeding on the leaves of the trees.

On the 13th of May it was very warm, both day and night; and next day almost all the Curculios which I destroyed had fed. From their first appearance I searched for them around and under the trees, but found none. But after four days' search, I knew they must be hid under leaves, chips, sticks, stones, or something. I laid myself down and examined more closely, and began to discover the little hump-back rascals.

Now, let me sum up my observations, and my mode of destruction. The warmth that brings out blossoms, brings the Curculios to their natural food and breeding places. They hide anywhere in the orchard where there is a cover. During sufficiently warm days and nights they go the tree—mostly crawling, I presume,—to feed and pair.

I destroy them in this way: By experiment at first I raked everything that they could possibly hide under from around the tree, and made the soil smooth for a couple of feet around the collar; I then put a few pieces of bark, each two or three inches long and an inch or so wide, down close to the tree. In a few hours I went and examined them. Ah! there the pests were hid! I enlarged the number of traps. Yes, I had the fellows using my houses, as well as eating my fruit! I cleared my orchard under the trees; made smooth two or three feet of the ground around each tree, and put chips, corn-cobs, pieces of old leather, stones—anything to give them shelter—near the butt. The enemy can be attacked in his habitat. Go around any time in the day, turn the traps over, and there the pests are —singly, in pairs and in clusters.

The weather on Friday night (13th) was warm, and the next day (14th) it was hot. Omitted killing one hot day, and next morning, from about seventy-five trees, I killed 1,648 Curculios in just one hour.

I have told my neighbors, and some of them are destroying their Curculios in the same manner. Mr. J. Whittlesey this morning, from under about two hundred trees, killed 2,514 in about two hours. In cool weather I find few, but during the first warm days they swarm. Let this method be unitedly tried, and we can save our fruit. W. B. Ransom.

St. Joseph, Mich, May 16, '70.

We are really sorry to damp the ardor and enthusiasm of any person or persons, when enlisted in such a good cause, but truth obliges us to do so nevertheless. Of course, Curculio extermination is possible! but not by the above method alone, as our Michigan friends will find to their sorrow. For a short time, early in the season, when the days are sometimes warm and the nights cold, and before the peach blossoms have withered away, we have succeeded in capturing Curculios under chips of wood and other such sheltered situations; but we have never been able to do so after the fruit was as large as a hazel-nut, and the Little Turk had got fairly to work. Our Michigan friends will, we fear, find this to be too truly the case.

This process, furthermore, cannot well be called a discovery, because it was discovered several years ago, as the following item from *Moore's Rural New Yorker*, of January 28th, 1865, will show:

How to Catch Curculio.—In May last we had occasion to use some lumber. It was laid down in the vicinity of the plum-yard, and on taking up a piece of it one cold morning, we discovered a number of Curculios huddled together on the underside. On examining other boards we found more, so we spread it out to see if we could catch more, and we continued to find more or less every day, for two weeks. We caught in all one hundred and sixty-one. So I think if people would take a little pains they might destroy a great many such pests. These were caught before the plum trees were n flower. What is most singular is, that we never found a Curculio on a piece of old lumber, although we put several pieces down to try them. They seemed to come out of the ground, as we could find them several times a day by turning over the boards. Mrs. H. Wier.

Johnsonville, N. Y.

But though Mr. Ransom can not properly claim to have made a new discovery, and though this mode of fighting will not prove sufficient to exterminate the Curculio, yet we greatly admire the earnestness and perseverance which he has exhibited. In demonstrating that so great a number of the little pests can be entrapped in the manner described, Mr. R. has laid the fruit-growers of the country under lasting obligations to him. It is a grand movement towards the defeat of the foe, and one which, from its simplicity, should be universally adopted early in the season. But we must not relinquish the other methods of jarring during the summer, and of destroying the fallen fruit; for we repeat, that the Plum Curculio will breed in the forest.

We are fast becoming perfect masters of this stone-fruit scourge. Already, through the kindness of Dr. Trimble, we have been enabled to breed several specimens of the first and only true parasite ever known to infest it; and, by a series of experiments now making, we hope, *Deo volente*, to be able to definitely clear up every mooted point in its history before Nature dons another wintry garb.

P. S.—About a week after the above article was in type, we found the following in the columns of the St. Joseph *Herald* of the 28th May:

At a meeting held on Monday, the 23d inst., at Benton Harbor, Dr. LeBaron, State Entomologist of Illinois, said: "The object for which I came to Benton Harbor was to collect some of the insects for future examination. I wish to secure and take home some of the larvæ to rear and observe their habits. From the habit of the curculio gathering under chips, not having been observed in Southern Illinois, I thought they might be a new kind. Besides the plum or peach curculio, there is another kind called the apple curculio, which we thought might be the one you are taking. Yet the difference is so slight that we have not been able to discover which it is. I shall take some home and carefully compare them. I would be glad if any of the audience would send me the larvæ of any new insects they discover, with the leaves on which they are found, for examination."

Dr. Hull, of Alton, State Horticulturist, said: They had heard of the new discovery, and had come over to investivate the curculio. He had never before heard, and knew nothing of this mode of destruction, and was surprised and gratified. It was certainly a great discovery. He thought it could not be the plum curculio, which he once thought were identical, until Dr. Walsh sent him his specimens and made clear the difference. The apple curculio spreads with extraordinary rapidity, and destroys the greater part of the apple crop of Illinois. The plum curculio stings, but does not breed in the apple; the apple curculio makes a round cut, difficult to see with the eye. The worm remains where the egg was laid until it matures, when it comes out and goes into the ground. He hoped this would turn out to be the apple curculio. It is the apple or plum curculio, for only one kind has been seen to-day. Curculio can not fly under a temperature of 70 degrees. They fly against the wind; but as yet he had been unable to determine the extent to which they migrate. Whether this be the apple or plum curculio, a great discovery has been made."

All which verily surprised us. What! the combined entomological and horticultural wisdom of Illinois not able to distinguish between the Plum and the Apple Curculio? Dr. LeBaron, so far as we are aware, has never claimed to be acquainted with the Apple Curculio, and we believe it is of quite rare occurrence around Geneva; he might therefore justly be cautions in the matter. But what shall we say of Dr. Hull, who has so often spoken of the Apple Curculio, and dwelt upon its habits, before horticultural bodies; and who must have slain such hosts of the Plum Curculio with his powerful and ponderous machine. Not able to distinguish between these two insects? Why, they differ more in the eyes of an entomologist than a sheep does from a cow!

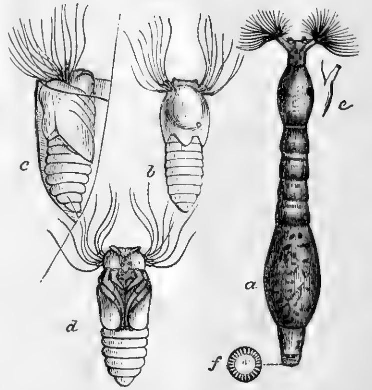
The snout of the Plum Curculio (*Conotrachelus nenuphar*) hangs down like the trunk of an elephant; it is short, stout, and does not admit of being stretched out horizontally forwards; and, as may be seen by referring to our Figure 92, is *scarcely as long as the head and thorax together,* and can be folded back between the legs, where there is a groove to receive it. The Plum Curculio is broadest across the shoulders and narrows behind, and moreover, the black sealing-wax-like, knife-edged elevations on the back, with the pale band behind them, characterize it at once from all our other fruit-boring snout-beetles.

The Apple, or Four-humped Curculio (*Anthonomus quadrigibbus*, Say), is a much smaller insect, with a snout which sticks out more or less horizontally and cannot be folded under, *and which is as long as the whole body.* This insect has narrow shoulders and broadens behind, where it is furnished with four very conspicuous humps, from which it takes its name. It has neither the polished black elevations nor the pale band of the Plum Curculio. In short, it differs generically, *and does not attack the peach.*

If the St. Josephites were a wine-growing, instead of a peach-growing people, we might, in our own minds, have been able to account for this lack of discrimination on the part of one who has said so much about both insects; but as it is (for the tax on peach-brandy must certainly preclude *its* manufacture there) we can give no other explanation than—well, more anon!

THE DEATH-WEB OF YOUNG TROUT.

[Fig. 143.]



EXPLANATION OF FIGURE 143.—(*a*) Larva, dorsal view, with fan-shaped appendages spread; (*b*) pupa, dorsal view; (*c*) same, lateral view; (*d*) same, ventral view; (*e*) thoracic proleg of larva; (*f*) manner in which the circular rows of bristles are arranged at anal extremity—all the figures being enlarged.

The culture of fish, and especially of the Trout, is attracting deserved attention in this country, from many persons who are at all favorably situated for carrying it on. The idea of propagating fish artificially is comparatively modern, and when we reflect on the success of the enterprise, notwithstanding those who first talked about it were looked upon as idle theorists; we yet have faith that, some of these days, certain beneficial and parasitic insects will to some extent be propagated and introduced into one country from another—utopian and chimerical as the idea may now appear to most persons.

To-day fish-culture has grown to be a most important and lucrative business in some parts of Europe, and it is fast acquiring importance in this country. It is an art yet in its infancy, and the few enterprising men who embark in it, in this country, will naturally meet with adverses, and must gradually perfect their art by dear-bought experience. Anything which will lead to a better understanding of the obstacles which render the business precarious, will therefore tend to perfect the art, and must be welcomed by those interested.

On page 174, under this same caption, we published an account of a worm which, by spinning a web in the water, proved very destructive to young trout in certain breeding ponds in the States of New York and Ohio. On page 211 we stated that this worm was the larva of a Two-winged Fly, belonging to the genus *Simulium*.

The habits of these larvæ are not yet completely known; and, as everything that bears upon the subject will prove interesting, and aid future observers, we make room for the following original observations of two of our correspondents. Mr. Seth Green, of Mumford, N. Y., says:

We find these larvæ exclusively upon stones in swift-running and rippling water. In a state of rest, fastened by the "sucker" at the end of the tail, they stand erect and move around with a circling motion of the head. They move from place to place by fastening the "tubercle" which is under the thorax, and by bringing up the tail end to it. The thread comes from the head end, but whether from the tubercle or not, my glass is not strong enough to discover. I think that this larva leaves a thread wherever it goes. At any rate, while putting those I sent to you into the bottle, they invariably dropped from the stick, leaving a thread behind them by which they could be lifted and moved from side to side in the water; and as, in taking away the stick, the thread became fastened upon the mouth of the bottle, we saw three or four at once actually climbing up these threads—not so fast as a spider would, but still at a pretty good pace.

Writing of the same larva, Sara J. McBride, also of Mumford, N. Y., says:

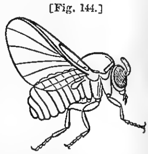
When about to change its position, it works for a few seconds with its maxillæ against the substance to which it adheres, and then, placing the last segments of its body firmly on the place thus prepared, moves its head off in another direction. Every time it moves its head, it leaves in the place a silken thread, something like a spider's thread, but much more delicate and fine. After it has been in one place a short time it leaves a "web," which is uneven and irregular in its angles and outline. When frightened this larva remains suspended in the water by means of its thread.

I have never observed it feeding on any aquatic plant, and so conclude its nourishment must consist of animalcules. Whether its web is for the purpose of securing its food, or the natural result of moving its head from place to place, I cannot ascertain. It exists in the larva state in running water, during the winter months, and spins a cocoon for its pupa of a conical shape, and closed at the lower end.

Upon two occasions we have received specimens of this larva from Mr. Green; but each time the water became so foul during the transit that the larvæ soon perished, and we were consequently unable to breed the perfect fly. While these larvæ were in our possession, we made sundry observations on their peculiarities; but the article which follows, from Baron Osten Sacken, on the transformations of the genus, is so exhaustive, that we content ourselves with presenting the life-like drawings at Figure 143. The slight differences in form between our figures of the pupa and those of Verdat may be accounted for, either by a difference in species or in maturity. We will also premise that our pupæ, like Verdat's and Scheffer's, had four principal branches and eight tracheal filaments, each side; that the silk is spun from the mouth (apparently from lower lip), and that the fan-shaped organs either serve to spread the web-nets, so as to entangle the animalcules which form this insect's food, or, what is more probable, serve, as do the ciliæ of many other small animals, to form a vortex by the rotary motion of the head observed by Mr. Green; and the animalcules, thus engulfed in this miniature mælstrom, are irresistably drawn towards the mouth.

Aside from its curious transformations, and this newly-discovered destructive habit in the larva state, this genus possesses an unusual interest from the fact that it furnishes the well known BLACK-FLY of the North, and the celebrated BUFFALO-GNAT of the Southwest; and, in order that the perfect form may be recognized, we present the annexed outline (Fig. 144, after Packard), of the former species, *Simulium molestum*.

[Fig. 144.]



Color—Black.

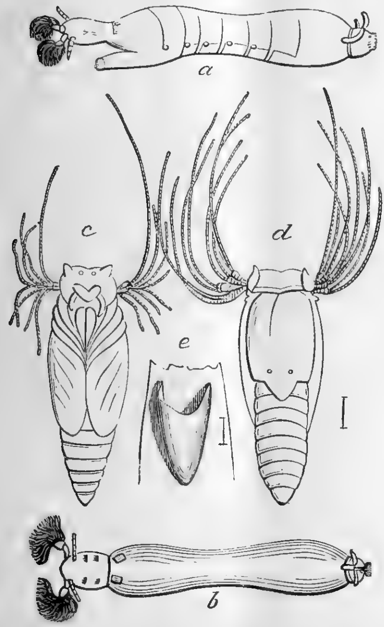
Where breeding ponds can be so protected as to prevent these flies getting at the water during the summer, it follows that the young fish will not be troubled with the web of the larvæ; but it is doubtful whether any such protection can be given in the majority of cases. We shall be glad to publish any further observations on the habits of these larvæ that may be made by parties possessing the proper facilities for study, and will add that, according to Osten Sacken, besides this spinning larva of *Simulium*, that of the genus *Chironomus* seems to weave the earthy sheath in which it lives, and that of *Tanypus* moves about in a light spun sheath, according to Lyonnet.

☞ By a strange oversight we omitted the name of Cyrus Thomas in our list of contributors published last month. Mr. Thomas was, many years ago, well known as a writer on Illinois entomological subjects, and, knowing that he is with us, heart and hand, in our work, we owe him an apology for this oversight.

ON THE TRANSFORMATIONS OF SIMULIUM.

BY BARON R. OSTEN SACKEN, NEW YORK.

[Fig. 145.]

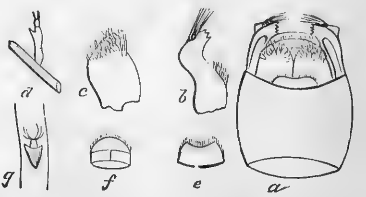


EXPLANATION OF FIGURE 145.—(*a*) Larva from a side view, enlarged, the hair-line above showing natural size; (*b*) same, from a back view; (*c*) pupa, ventral view, enlarged; (*d*) same, dorsal view; (*e*) pupal pouch, enlarged, the hair-line showing natural size.—*After Verdat.*

Several excellent observers have studied the natural history of this genus, which, except in a few doubtful points, may be considered as fairly elucidated. The following account has been prepared by comparing my own observations, made upon a species which I found in the environs of Washington, with those of Verdat and others. In this account, the discrepancies between authors have been carefully noted, in order to draw the attention of future observers to those points which deserve to be investigated. It must be borne in mind, however, that some of these discrepancies may be due to the fact that the observed larvæ belonged to different species of the genus *Simulium*.

The larvæ are frequently found in small streams of running water, in large societies, fastened by their tails to stones or to the leaves or stalks of water plants. They are about 0.35 of an inch long, subcylindrical, attenuated in the middle, incrassated towards both ends; the latter third of the body is stouter than the anterior third, and almost club-shaped; head subquadrate, yellowish, with a pair of small, approximate black dots on each side. Verdat took them for eyes, but I did not discover the slightest convexity in them. They are evidently below the horny shell of the head. Antennæ slender, subuliform, apparently four-jointed. Epistoma horny, subtriangular; upper lip fleshy, fringed with long, delicate hairs; its ordinary position is not horizontal, but almost vertical, at right angles with the upper surface of the head and as if lapping over the orifice of the œsophagus; (it can be perceived only by looking in the direction of the axis of the body, as it is concealed between the other parts of the mouth); between the mandible and the epistoma and close by the antennæ the remarkable flabelliform organs, peculiar to this larva, are situated; they consist of a stout stem bearing a fan of thirty-five or forty delicate horny rays, each of the shape of a very long, slender scythe; they open and close like a fan; when closed, the tip of this fan is inside of the mouth and touches the tip of the mandibles; its opposite end forms an

[Fig. 146.]

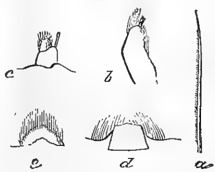


EXPLANATION OF FIGURE 146.—(*a*) Head of larva, from underside; (*b*) its mandible; (*c*) maxilla; (*e*) under lip; (*f*) upper lip—all enlarged; (*d*) larva natural size, attached to a plant; (*g*) pupa natural size, within its pouch.—*After Verdat.*

angle or knee with the stem. They may be compared to the antennæ of the *Melolonthidæ*, only the rays are much more numerous. The *mandibles* consist of a pale-colored, apparently fleshy, basal piece, with a tuft of hairs on the inside, and to their upper extremity are fastened, 1st, a small, horny, black tooth, having the shape of an ordinary mandible, bifid at the tip, and with a very minute projection inside of this indentation; 2d, a brush of hairs, or perhaps of scythe-shaped organs analogous to those forming the fan. The *maxillæ* consist of a stout, fleshy basal piece, an elongated apparently two-jointed palpus (first joint cylindrical, second short, rudimentary), and an internal, rounded, thumb-shaped lobe, bearing tufts of hairs on both sides. *Under lip* and *mentum* are represented by a horny, projecting, slightly emarginate and tridentate piece, behind which there is another piece, fringed with numerous hairs, especially on the sides. The body of the larva is smooth, of a dirty greenish-gray, this appearance being produced by numerous spots of this color on a pale ground. On the underside of the thoracic portion there is a subconical, retractile process, crowned with a circular row of bristles. If examined with a lens, this organ appears to consist of a system of parallel black lines; but if a much stronger magnifying power is used, these lines prove to be dense rows of short, sharp bristles. The joints of the body are not distinct; still I could count twelve joints, five of which formed the club-shaped anal portion of the body, the four or five joints immediately preceding them are more apparent than the others. The anal extremity consists of a subcylindrical, truncated protuberance, crowned with rows of bristles, similar to those of the thoracic proleg. Immediately below it, on the underside of the body, there are three (Fries mentions only two) short, cylindrical, soft, curved, retractile tentacles, to which the large tracheæ lead. These are probably the organs of respiration. I did not discover any traces of stigmata, nor does any other author mention them.

The strange fan-shaped organs are apparently used for procuring food. Under a strong magnifying power, each of the scythe-shaped rays which compose it appears lined on the inside with exceedingly minute hairs, the fringe of which is interrupted at regular intervals by short, conical projections. I have already remarked above, that the tuft on the mandibles consists, if I have seen right, of a row of small rays of a consistency similar to those forming the fan; it is probable that this tuft is used for cleaning the fan when it is closed and turned with its tip towards the mandible. The fan is usually spread out, but I have noticed that sometime before assuming the pupa state, the larva keeps it constantly closed, evidently because, at this period of its life, it ceases to feed.

[Fig. 147.]



Explanation of Figure 147.—(*a*) Portion of a ray of the fan; (*b*) mandible; (*c*) maxilla; (*d*) under lip; (*e*) upper lip—all enlarged.—*After Osten Sacken.*

What the homology of these organs is, I am not able to suggest. They seem to be absolutely supernumerary, as the mouth, without them, is complete, that is, contains all the parts of a typical insect mouth. This is an interesting question, worthy of being inquired into. As to the use of these fans, it is undoubtedly for catching the animalcules which constitute the food of the larva; but what those animalcules are, again we do not know, and have not been able to investigate. The vague statement of Planchon, that in the stomach of one of the larvæ he found a prodigious quantity of round or elliptical animalcules, some dead, some still alive, cannot satisfy us.

The larvæ are sometimes seen swimming by means of a jerking motion. They can also walk, by doubling their body and using alternately their anterior proleg and their anal protuberance.

According to Verdat, the larva moults more than once. When full grown and about to undergo its transformation, it spins an obconical, grayish, semitransparent pouch, fastened to a plant or a stone; in this pouch the pupa is inserted, its anterior end protruding above the upper rim. I have seen the process of spinning. The larva does not leave its foothold but remains in the centre of its work, using its mouth, from which the filament is drawn, and helping with its proleg. (According to an observation communicated by Audouin to Westwood, the cocoon is first formed entire, closely resembling one-half of a diminutive egg, cut longitudinally, and fastened by the flat surface to the leaf or stone; subsequently, the upper end is eaten away as far as a thickened arch, previously formed. As I have happened to come across this remark long after I made my observations, I am not able either to confirm or to reject it.) According to Planchon, the skin is not cast by the larva, but seems to dissolve and thus gradually to disclose the outlines of the pupa. (According to another author, the head alone is thrown off.)

The pupa, on each side of its thorax, has a tuft of filaments, serving evidently for respiration. From a common root I saw eight principal branches proceed, which, at some distance, split in two, thus forming *sixteen* filaments. (Fries mentions and figures only *four* filaments on each side; Fabricius, *six*; Verdat's and Scheffers' larvæ had eight. I do not know how to account for these differences.) Verdat mentions "a cylindrical body, at the basis of these tufts, appearing scaly at its root and conical, spongy at the tip." I did not see anything of the kind. On the abdomen of the pupa, I perceived, along the posterior margins of the 3d and the 4th dorsal segments, rows of *eight* very minute spines; they are arranged in groups of four, separated by a very short interval; near the tip of the abdomen there is a row of still more minute spines.

I did not see the exclusion of the perfect insect; but, according to Verdat, after 13—14 days spent in the pupa state, the thorax splits and the fly escapes, wrapped in an air-ball, which makes it rise rapidly to the surface of the water; during this interval, the limbs remain folded as in the pupa; but as soon as it reaches the surface, the limbs unfold themselves in an instant and the fly walks on the water towards the next stalk, where it remains until its wings have become sufficiently hardened.

The imago of *S. reptans* has acquired in Europe, under the name of "the gnat of Columbatz," a reputation equal to that of *Glossina morsitans*, the African Tzètzè. Immense clouds of this bloodthirsty gnat infest the banks of the Danube on the Hungarian as well as on the Servian side, where the castle of the Columbatz is situated. Their numbers are such that animals attacked by them seldom escape death, as they not only cover the skin, but penetrate in every orifice, even the lungs, and produce the most intolerable inflammation. More than six hundred head of cattle were destroyed in that region in the single year of 1783. The same gnats are mentioned in Poland as far back as 1679, where, according to the (probably exaggerated) accounts of the time, thirty men were killed by them. In the Northern States and Canada, *Simulium* is known under the name of Black-fly, and is, in some regions, very annoying. In the West, it is called *Buffalo gnat*, and I have heard of a case of destruction, caused by them to mules at Vicksburg, which fully equals that of Columbatz.

AUTHORITIES.

EICHHORN—*Naturgesch. d. Kleinsten Wasserthiere.* Danzig, 1774. Tab. VII. Contains, according to a statement in Thon's Archiv, Vol. II, a rough figure of the larva.

OTTO FABRICIUS—Schrift. d. Gesellsch. d. naturf. Freunde in Berlin, Vol. V, p. 254–259. (1784.) The article is entitled "Beschreibung d. Atlas-mücke und ihrer Puppe," and contains a rough figure of the pupa, its pouch, and of the perfect insect. The larva was not known to Fabricius.

VERDAT—Mem. pour servir à l'histoire des *Simulies*, présenté à la Soc. d'hist. natur. de Bâle en 1821. In Naturw. Anz. der Schweizer. Gesellsch; 1823, Vol. V, p. 65, translated in German in Thon's Archiv, II, 2, pp. 66–69, with figures. This is the principal paper on the subject; the figures are very good; they are reproduced on a reduced scale in *Westw. Introd.*, II, fig. 126, 19, 20. Although Verdat calls the species *S. sericeum* (*syn. reptans*), I am inclined to think that it is *S. ornatum*.

FRIES—*Monogr. Simul. Sueciæ* (in Dissert. Academica: "Observationes entomologicæ"), Pars I, fig. 6–7 (1. p.), 1824. Translated (without figures) in Meigen, Europ. Zweifl. VI, p. 309. Some discrepancies between Fries' and Verdat's account have been adverted to above. Meigen's extract is evidently wrong in stating that the larva lives *in* instead of *on* the stalks of plants.

PLANCHON—*Histoire d'une larve aquatique du Genre Simulium;* Montpellier, 1844. Reproduction of already known facts, with some new details, and especially some remarks on the anatomy of the larva. No plates. *S. rivularis*, n. sp.

KOLLAR—*Beurtheilung des von Dr. Medovicz an die Serbische Regierung erstatteten Berichtes üb. die Entstehung und Vertilgung der Columbatzer Mücken.* (Sitzungsbes. d. Wien. Acad., 1848; with three plates). Medovicz's report contained many errors; for instance he mistook another larva for that of *Simulium*. Kollar corrects these errors, but otherwise gives nothing new, except the figure of the larva, which is drawn on a large scale from nature. The figure of the pupa is borrowed from Verdat.

SCHEFFER—In Rossi's *Diptera Austriaca*, p. 14 (1848), *S. reptans* (*sericeum*). Short note; nothing new.

WESTWOOD—Gardener's Chronicle, 1848, p. 204 (with figures). Extract from the former authors; figures copied from Verdat, on a reduced scale.

KÖLLIKER—Observationes de prima insectorum genesi. Turici, 1842. Dissert. inaug. Embryological researches on the development of the larva in the egg. (*S. canescens*, Bremi, n. sp.)

BLACK KNOT.

It was long ago shown in the *Practical Entomologist* by Mr. Walsh, that the Fungoid disease known under the name of "Black Knot" to infest the cultivated Cherry, was quite distinct from the disease of the same name which attacks the cultivated Plum; and that the former most probably took its origin from the wild Choke Cherry (*Cerasus virginiana*), and the latter from the common wild Plum (*Prunus americana*). Hence there followed the important practical consequence, that Black Knot could not spread from Cherry on to Plum or from Plum on to Cherry; each parasitic fungus confining itself to its appropriate tree.

In July, 1869, we were favored by Mr. B. N. McKinstry, nurseryman, of East Sumner, Kankakee county, Illinois, with specimens of Black Knot growing quite abundantly with him, as he says, upon the Miner Plum, but not on any other cultivated plum. A single glance suffices to show that this diseased growth is essentially distinct from the common Black Knot of the Plum, although like this last it is evidently of fungoid origin. In fact, both in color, in external texture, and in internal organization the two differ so widely, that "Brown Knot" would be a far more appropriate name than "Black Knot" for the affection of the Miner Plum.

As the Miner Plum is a cultivated variety of the Chickasaw Plum (*Prunus chicasa*), it would seem to follow that there are three distinct Black Knots, originating respectively from Choke Cherry, from the common Wild Plum and from the Chickasaw Plum; and further, that the first is confined among our cultivated fruits to Cherry, the second to our common tame plums, and the third to the Miner Plum. It is very remarkable that in Europe they have no Black Knot at all, whether upon Cherry or Plum.

NOXIOUS LARVÆ.

BY DR. WM. LE BARON, GENEVA, ILLS.

Whilst insects are much more beautiful and perfect, and consequently more attractive and interesting, both to the entomologist and the amateur, in the imago or winged state, than in the larva or grub state, yet it is in this last condition that they are of chief importance to the farmer and horticulturist. This we shall easily understand from the following considerations. In the first place, it is in the larva state that the insects accomplish the whole of their growth; no insect increasing in size after it has attained the winged form. It is therefore in the larva state that the greatest amount of food is required, and accordingly it is in this state only, with a few exceptions, that insects commit those extensive ravages which often render them the scourge of the husbandman.

Secondly, many insects which in the larva state are furnished with mandibles or teeth fitted for gnawing herbage, are so completely changed, that in the perfect state, the mouth consists of a long flexible tube or sucker, incapable of injuring vegetation. Such are the extensive tribe of caterpillars, which, in their perfect state, become converted into moths or butterflies.

Thirdly, as a general rule, insects live much longer in the larva than in the perfect state, and therefore have more time for mischief. Many of the Lepidoptera live several months as larvæ, but only a few days as imagines or perfect insects. Some of the most pernicious Beetles, namely, the May-beetle, which comes from the White grub, and the Two-striped Saperda, which is the parent of the Round-headed Apple-tree Borer, exist three years in the larva state, and not often more than as many weeks in that of the perfect insect.

It is in the larva state, therefore, we repeat, that insects are of the most importance to the agriculturist, and it is natural, when he meets with these mischievous creatures, that he should feel interested to know what is their name and nature, and into what kind of winged insects they will ultimately be changed. It is in order to afford some assistance in gratifying this laudable curiosity that we have drawn up a few practical generalizations, which are recorded in the sequel.

Insects, with respect to their transformations, are divisible into two widely different sections. In one the metamorphosis is said to be incomplete; that is, the insect retains the same form, or nearly the same, in all its stages of larva, pupa, and imago, and is active in the pupa, as well as in the other states. The pupa is distinguished by having rudimental wings, and the imago by having wings fully developed. The grasshopper furnishes a familiar example of this kind of metamorphosis.

In the other section, the metamorphosis is complete; that is, the insect undergoes such a total change that its several states bear no resemblance to each other, and the insect is inactive in the pupa state. The caterpillar changing to a chrysalis, and then to a moth or butterfly, furnishes a well known instance of complete metamorphosis. To the former division belong the orders Orthoptera (Grasshoppers, &c.) and Hemiptera (Bugs, Leafhoppers, &c.); whilst the latter includes the vast majority of insects, constituting the comprehensive orders of Coleoptera or Beetles, Lepidoptera or Scaly-winged Flies, Hymenoptera or Clear-winged Flies, and Diptera or Two-winged Flies. The order Neuroptera, which is in a great measure aquatic, forms a connecting link between the two sections, the greater number being active in all their states, whilst in a few families, such as the MYRMELEONIDÆ (Ant-lions), and the HEMEROBIIDÆ (Lace-wings), the species undergo a complete transformation.

If, in accordance with the views of some recent authors, we unite the anomalous group of STREPSIPTERA to the order Coleoptera, and moreover include the harmless PHRYGANEIDÆ in the order Neuroptera, then we can make the broad assertion that every order of insects contains species injurious to mankind. By far the larger proportion of noxious insects belong to the two orders Coleoptera and Lepidoptera, either one of which contains nearly as many injurious species as all the other orders together.

Of the one hundred and seventy-eight families recognized by Mr. Westwood in his classification of insects, sixty-five, or rather more than one-third, contain noxious species. Of these sixty-five families, I find but six in which the species are injurious exclusively in the imago state, viz., the Cantharides, the Rutelidæ and the Cetoniidæ amongst the Coleoptera, the Formicidæ (Ants) in the order Hymenoptera, and the Culicidæ (Mosquitoes), and Tabanidæ (Horse-flies) in the order Diptera. And of these six, none except the Cantharides can be classed with the more seriously injurious insects. The species of all the other fifty-nine families are injurious exclusively or chiefly in the larva state. In some instances, indeed, and especially amongst the phytophagous Coleoptera, namely, the Chrysomelidæ and their allied families, and also in those orders wherein the species undergo an incomplete metamorphosis, the larvæ and perfect insects usually feed together, and it might be thought impossible, at first sight, to tell which are the more destructive. But when we consider the important fact to which we have before adverted, that the whole growth of insects takes place in the larva state, we must conclude that even in these cases, the principal damage must be effected whilst the insects are in the preparatory stage. If to this we add that one of the most destructive orders of insects, namely, the Lepidoptera, commit all their havoc in the larva form of caterpillars, we shall be able to form some estimate of the preponderance of damage effected by insects in the larva state.

Let us now inquire if larvæ exhibit any characters by which we can so classify them as to determine to what orders and families they will respectively belong when they shall have attained their perfect state.

The difficulty which has attended all attempts to classify larvæ upon their own characters, and at the same time preserve their relationship to their respective imagines, strongly exhibits the comparative inferiority or degradation of the larval state. We can indeed classify larvæ into what seem to be natural groups, founded upon their most important and prominent characters; but when we come to put opposite to them, in parallel series, the perfect insects which these larvæ produce, we are astonished to find that every vestige of relationship is lost. Take, for example, the classification of larvæ by Kirby and Spence. These authors arrange larvæ in five principal groups. The first group produces, when arrived at the perfect state, a heterogeneous mixture of Coleoptera, Hymenoptera and Diptera. The second group produces Diptera only. In the third, two of the most remote orders of insects, the Coleoptera and Neuroptera are brought into juxtaposition. In the fourth, a part of the Tipulidæ are separated from the rest of their family, and from the Dipterous order, and associated with the Micro-Lepidoptera. And in the fifth group, Coleoptera, Hymenoptera and Lepidoptera are indiscriminately associated together.

Still the practical question remains whether any general rules can be established, by which we can know what form the noxious larvæ we meet with, will ultimately assume.

In order to understand what follows, it is necessary to state that larvæ have legs of two kinds: first, the true legs, representing the legs of the perfect insect, which are comparatively firm, conical, and jointed, and, when present, are almost always six in number, and attached to the first three segments of the body. Secondly, the spurious legs, or prolegs, which are short, thick, muscular and unarticulated, varying in number from two to sixteen, and attached to one or more of the eight last segments.

1st. *Generalization.* All larvæ generally known as Caterpillars, and distinguished by having both legs and prolegs, produce either Lepidoptera, or Saw-flies in the order Hymenoptera; and the larvæ of the Saw-flies are distinguished from those of the Lepidoptera by having more than five pairs of prolegs; and by having only two eyes, whilst the true caterpillars have ten or twelve, and also by their habit of rolling themselves into a spiral coil.

2d. As a general rule, hairy caterpillars produce moths, whilst spiny or naked ones produce butterflies or sphinges. The rule may be more accurately stated thus: All densely haired caterpillars produce moths, but all the larvæ of moths are not hairy. The caterpillars of the butterflies and sphinges are either naked or ornamented with spines, or with very short or scattered hairs.

3d. Wood-boring larvæ belong mostly to the Coleoptera; but also to a few families of the Lepidoptera, namely, the Ægeridæ, the Hepialidæ, and a few exceptional Tortricidæ. The larvæ of the Lepidoptera can always be distinguished from those of the Coleoptera, by the presence of prolegs on the intermediate segments. A few Coleopterous larvæ have one pair of prolegs on the anal segment, but more generally only one such leg.

4th. All leaf-sucking larvæ belong to the order Hemiptera (including the Homoptera).

5th. All leaf-gnawing larvæ, excepting grasshoppers, and the caterpillars above treated of, belong to one tribe of Coleoptera, distinguished by the title of Phyllophaga, or Leaf-eaters, and comprising the four families Crioceridæ, Galerucidæ, Cassididæ, and Chrysomelidæ. These larvæ, moreover, can generally be identified by their short, wrinkled forms, their sluggish motions, and some of them by the singular habit of protecting their bodies by their own excrement.

6th. All larvæ found underground, excepting those which enter it only for the purpose of undergoing their transformations, are divisible, according to their habits, into two sections. First, the subterranean larvæ, properly so called, which live under ground, and feed upon the roots of plants; and, secondly, those which subsist above ground, but burrow into it, when not feeding, for the purpose of concealment. True subterranean larvæ are found in the orders Coleoptera, Hemiptera, Homoptera, and Diptera.

None of the last order, except a few of the Tipulidæ, have ever been known to multiply so as to be seriously injurious to vegetation. But in the Coleoptera we have the well known White-grub of the May-beetle, and the large Grape-root Borer, in the family Prionidæ; and, belonging to the Homoptera, is the pernicious Apple-tree Root-louse. The second section is limited almost exclusively to the notorious tribe of Cut-worms, all of which belong to the family of Noctuidæ, in the order Lepidoptera.

These are a few of the more obvious general results which we derive from the observation of insects, under the two limitations of noxious habits and the larval state. Others, less remarkable, perhaps, but equally interesting, would be suggested by a more minute study of the subject. But this would extend our article to an unreasonable length.

INSECT EMBRYOGENY.—Three years ago the Entomological world was much interested in the discovery of the phenomenon of parthenogenesis in the larva of a gnat (*Cecidomyia*). The particulars are given in Dr. Tripps's paper in the *Popular Science Review* for April, 1867. They are very curious. It has not hitherto been surmised that the larva of *Aphrophora spumaria*, the Cuckoo-spit, affords another instance. Baron DeGeer, the great Swedish naturalist, noticed that the female Frog-hoppers (so the perfect insects are called) become so gravid in September that they can scarcely fly. The eggs could not well cause this inconvenient gravity, because they are deposited at a much later season—in England certainly, and probably in Sweden also. The eggs do not seem to encumber the insect, according to my observation, even in December immediately before their deposition. We may, therefore, suppose DeGeer's observation to have applied to females about to become viviparous, though he does not seem to have suspected it. That it might have been so is rendered certain by the occurrence of an embryo within the abdomen of a larva taken in my garden, and now in my cabinet. The claws, eyes, proboscis and antennæ are to be clearly distinguished, and even the lenses of the eyes, when considerably magnified. The antennæ appear of an unusual size, but they comprise only the normal parts, and are obviously immature. The mother larva in this example is about three-parts grown to maturity, the wing-cases being still incomplete beneath the outer skin. * * * It may now be left to entomologists and physiologists to pursue this new fact, unexpectedly started upon a well beaten field.—*Science Gossip.*

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 9.

The Grape-vine Plume.

(*Pterophorus periscelidactylus*, Fitch.)

[Fig. 148.]

Colors—(*a*) white; (*b*) light-brown; (*d*) tawny-yellow.

Just about the time that the third bunch of grapes, on a given shoot, is developing, many of the leaves, and especially those at the extremity of the shoot, are found fastened together more or less closely, but generally so as to form a hollow ball. These leaves are fastened by a fine white silk, and upon opening the mass and separating the leaves, one of two caterpillars will generally be found in the retreat. We say one of two, because the retreat made by the smallest of the Blue Caterpillars of the Vine, namely, the larva of the Pearl Wood Nymph (Fig. 102, *a*, p. 152), so closely resembles that of the Grape-vine Plume under consideration, that until the leaves are separated it is almost impossible to tell which larva will be found. Both occur at the same time of year, and both have been more destructive than usual the present season in the vicinity of St. Louis. In an ordinary season they do not draw together the tips of the shoots till after the third bunch of grapes is formed, and in devouring the terminal bud and leaves, they do little more than assist the vineyardist in the pruning which he would soon have to give. They act, indeed, as Nature's pruning-knives. But the late severe frost which killed the first buds this year, so retarded the growth of the vines that the worms were out in full force before the third bunch had fully formed, and this bunch was consequently included in the fold made by these worms, and destroyed.

The larva of the Grape-vine Plume invariably hatches very soon after the leaves begin to expand; and though it is very generally called the LEAF-FOLDER, it must not be confounded with the true Leaf-folder, described in our last number, and which does its principal damage later in the season. At first the larva of our Plume is smooth and almost destitute of hairs, but after each moult the hairs become more perceptible, and when full grown the larva appears as at Figure 148, *a*, the hairs arising from a transverse row of warts, each joint having four above and six below the breathing-pores* (see Fig. 148, *e*). After feeding for about three weeks our little worm fastens itself securely by the hind legs to the underside of some leaf or other object, and, casting its hairy skin, transforms to the pupa state. This pupa (Fig. 148, *b*), with the lower part of the three or four terminal joints attached to a little silk previously spun by the worm, hangs at a slant of about 40°. It is of peculiar and characteristic form, being ridged and angular, with numerous projections, and having remnants of the larval warts; it is obliquely truncated at the head, but is chiefly distinguished by two compressed sharp-pointed horns, one of which is enlarged at Figure 148, *c*, projecting from the middle of the back: it measures, on an average, rather more than one-third inch, and varies in color from light green with darker green shadings, to pale straw-color with light brown shadings.

The moth (Fig. 148, *d*) escapes from this pupa in about one week, and, like all the species belonging to the genus, it has a very active and impetuous flight, and rests with the wings closed and stretched at right angles from the body, so as to recall the letter T. It is of a tawny yellow color, the front wings marked with white and dark brown as in the figure, the hind wings appearing like burnished copper, and the legs being alternately banded with white and tawny yellow.

All the moths of the family (ALUCITIDÆ) to which it belongs have the wings split up into narrow feather-like lobes, and for this reason they have very appropriately been called Plumes in popular language. In the genus *Pterophorus* the front wings are divided into two, and the hind wings into three lobes. In this country, a somewhat larger species (*P. carduidactylus*, Riley) occurs on the Thistle, and though bearing a close resemblance to the Grape-vine Plume in color and markings, yet differs very remarkably in the larva and pupa states.

From analogy we infer that there are two broods of these worms each year, and that the last brood passes the winter in the moth state. We have, however, never noticed any second appearance of them, and whether this is from the fact that the vines are covered with a denser foliage in the summer than in the spring, or whether there is really but one brood, are points in the history of our little Plume which yet have to be settled by further observation.

On account of its spinning habit this insect is easily kept in check by hand picking.

* As Dr. Fitch's description of this larva is the only one we know of, and is rather incomplete, we subjoin the following for the scientific reader:

MATURE LARVA OF PTEROPHORUS PERISCELIDACTYLUS.—Average length 0.50 inch. Color pale greenish-yellow. Joints separated by deep constrictions. Each joint with a transverse row of large cream-colored warts, giving rise to soft white hairs, many of which are slightly clubbed at tip. Four of these warts above, and six below stigmata, the four lower smaller than the six upper ones. The hairs from warts above stigmata diverging in all directions and straight, those from the row immediately below stigmata decurving. Other short and more minute club-tipped hairs spring from the general surface of the body between the warts. Head yellow with labrum slightly tawny. Legs also yellow, immaculate and very long and slender. Described from numerous living specimens.

THE PEAR-LEAF FUNGUS (*Ræstelia cancellata*).—According to the *Gardener's Chronicle* this fungus seems to be unusually abundant this year. Its connection, if not its identity, with the curious yellow fleshy fungus often found on the Savin Juniper (*Podisoma sabinæ*), has been asserted by M. Œrsted, and confirmed by M. Decaisne. The latter botanist placed two plants of Savin affected with *Podisoma*, one in the ground in the midst of four perfectly healthy young Pear trees, and the other among the branches of a large, equally healthy Pear tree (*Bon Curé*), at a distance of six to eight feet from the ground. After a few days the *Ræstelia* appeared upon almost all the leaves of the five Pears. Moreover, some leaves which were purposely smeared on their under surface with the slimy mucus of the *Podisoma* were speedily reddened over by the *Ræstelia*. M. Roze, however, has not succeeded in his endeavors to repeat this experiment, and he calls attention to a circumstance which is very significant, that is to say, the presence of true *Puccinia* (smut) on the *Podisoma* of the Savin in some seasons, and its absence in others, from which he cautiously surmises that the Pear-leaf fungus may be a form of the *Puccinia*.—*Science Gossip.*

AT a late meeting of the London Entomological Society, Mr. Westwood exhibited an *Aphodius*, which was given to him by M. Jenyns, who assured him that this insect was frequently vomited by the Hottentots.

HOW TO COLLECT AND STUDY INSECTS—No. 3.

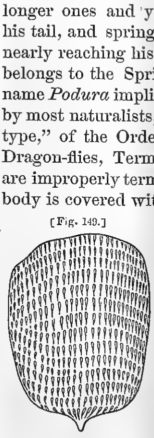
BY F. G. SANBORN, BOSTON, MASS.

Having equipped ourselves with the few simple instruments previously described, let us sally forth to some unfrequented spot—a wooded hill-side, sheep pasture, or, if well provided with water-proof boots, a meadow. Each and all such places prove good "collecting ground," and open a vast field of research to him who keeps his eyes open and knows how to use them. Here are a few small stones, covering a square foot or more of soil; turn them, or rather lift them carefully and reverse them, so that you can inspect with one eye what has been for some days the under surface, while the other eye watches for any moving, and therefore probably endeavoring-to-escape creature. This little golden-red knob, not so large as a pin's head, looks as if it was part of the stone; but wet your forefinger and touch it, not exerting a pressure of *more* than an ounce to the square inch. You have brought up on his back a little kicking hexapod, which makes futile struggles to get upon his feet while confined to your great finger by the cohesive attraction of saliva. Slip your left forefinger and thumb into your vest pocket, and extract your magnifier, open and focus it. What superb joints in all those supple feet and flexile antennæ; what lustre in those thimble-like, brown eyes; how the little abdomen curves, contracts and expands, and how the tiny elytra separate, and the wings, matted with the moisture from your finger, strive to lend their feeble aid to raise the unhappy proprietor from his ignoble position! Nay, even the microscopic mouth opens, the little brown jaws gape as if to remonstrate, but your coarse auditory nerve catches no sound. Replace your pocket glass and withdraw a small vial; if you have learned the use of your fingers, take out the cork with your thumb and forefinger, while you hold the vial steadily between the other three fingers and the palm of the left hand. Now shift your right forefinger to the mouth of the vial, so that the little "specimen" is enclosed, and with a quick motion float him off in the alcohol, re-cork, and watch him if you please. He kicks still, waves his antennæ frantically, opens and shuts his wings, perhaps twenty, forty, sixty seconds, and with a placid smile upon his otherwise immovable features, he folds his small limbs upon his breast, and passes happily into that sleep which knows no waking.

What is all this about? Oh, you have simply captured a specimen of *Olibrus nitidus*, LeConte, Order *Coleoptera*, Family *Phalacridæ*. Original describer, F. E. Melsheimer, in *Proc. Phila. Acad. Nat. Sciences*, Vol. II., page 102. And this is what characterizes him, and distinguishes him from every other *Olibrus* that has ever been seen: "Short, ovate, greatly convex, light chesnut, highly polished, impunctured: head with distant, very minute punctures; eyes black: sutural stria of the elytra faintly impressed: ½ line long."

But this is not collecting. Look again at the stone; nothing more there, eh? Don't you see small, shining, black objects, about five or six of them, moving slowly along? Bring your magnifier to bear on one of them. It looks like a diminutive wheel-barrow turned bottom upwards, with an immense pair of sideboards dragging on each side, or like a minute but irritated turkey-gobbler sweeping his stiffened wings behind him. Wet your finger and look at him beneath; he has eight feet surely, and won't do for a true insect. True, he is an *Arachnide*, or Spider, and belongs to the class denominated Mites. So few students have studied up the Mites of this country, that it is most probable he has never received a name; but put him in a vial with alcohol, and note when and where he was found; at some future date we shall be able to investigate his structure more closely with a powerful microscope, or shall meet some one who can tell us more about him. What are those little gray creatures that are leaping so actively, and sometimes running quite briskly on the ground or on the flat surface of the stone? Look at the under side of one of these longer ones and you see a little fork hinged at his tail, and springing up and down, its points nearly reaching his hinder feet. This little insect belongs to the Spring-tails, or, as the technical name *Podura* implies, Foot-tails. It is considered by most naturalists, as a low form, or "degraded type," of the Order *Neuroptera*, to which the Dragon-flies, Termites or White Ants as they are improperly termed, and May-flies belong. Its body is covered with delicate scales, shaped like those of fishes, and smaller and finer than those on the wings and bodies of the butterflies and moths. These scales (Fig. 149) were used formerly as "test objects" for the compound microscope, and are so used to some extent to-day for cheaper instruments, the fine lines ruled along the scale being difficult to see clearly, or to "define," as the phrase is, with a poor glass. We can keep them tolerably well in alcohol, but should use a

[Fig. 149.]



separate vial, as they will get badly rubbed if kept in the same place as the harder shelled insects. But we can put in with them those short, rounded little hoppers, of a greenish color, not bigger than a pin's head, which also have a forked spring in their tails, and belong to the genus *Smynthurus*.

Have you got through with the little world under this stone? If so, slip your net on the end of your walking-stick, for here comes a fellow on the wing, his colors gleaming and flashing in the sun. Wait; now is your time, strike! Now twist your wrist slightly, so as to bring the weight of the net across the mouth of the loop. You can now grasp the net below the loop, and pick out, with the other hand, the specimen; or pin it through the net, as you prefer. What does it look like? "A darning-needle." Oh! well, you can introduce your hand and seize it without apprehension, for it cannot harm you, spite of its formidable appearance, and the old women's traditions, floating in your memory, of their "sewing up folk's mouths," "flying in at one ear and out the other," "stinging horses," &c. Drop an atom of chloroform on him just under his wings on each side; now he is still. What delicate colors in that slender body; what glorious eyes, in whose depths you seem to see the spirit of life retreating sorrowfully from the graceful body it had inspired but now. Those glassy wings, so transparent, and so crowded with slender dark veins, no longer obey the impulse to soar; those long black spiny feet, one of which faintly moves, and again contracts, as if with a memory of duties undone, are no longer capable of supporting their owner on some sprig or leaf! It hardly seems as if this beautiful creature, larger than some birds, could be related to those little "spring-tails" we just bottled. True, but the evidence is not all in; we are just beginning to learn the connection between species, and genera, and families, and orders, and classes. Let us have patience, and observe carefully the structure and habits of each insect that comes in our way, and we may perhaps discover day by day some of the links that connect this Dragon-fly (*Anax junius*) with the Spring-tails (*Podura*).

TOADS VS. INSECTS.

As summer advances the question of Toads *versus* Insects is sure to come up, and perhaps an experiment of mine on the capacity of a toad may be of interest. Dr. T. W. Harris remarked to me some twenty years ago, that he supposed the odor of the Squash Bug (*Coreus tristis*), would protect it from the toad, and to test the matter I offered one to a grave-looking Bufo under a cabbage. He seized it eagerly, but spit it out instantly, reared up on his hind legs and put his front feet on top of his head for an instant, as if in pain, and then disappeared across the garden in a series of the greatest leaps I ever saw a toad make. Perhaps the bug bit the biter. Not satisfied with this, I hunted up another old toad, who lived under the piazza, and always sunned himself in one place in the grass, and offered him a fine Squash Bug, which he took and swallowed, winking in a very satisfied manner. Twenty other fine bugs followed the first, in a few moments, with no difficulty nor hesitation in the taking or swallowing, though, from his wriggling and contortions afterward, it seemed as if their corners did not set well within. The stock of bugs being then exhausted, I found a colony of smooth black larvæ on a white birch, each about three-quarters of an inch long, and fed him over a hundred of them. Touching one of them with the end of a straw, it would coil around it, and then, when shaken before him, he would seize and swallow it, at first eagerly, but with diminished zest as the number increased, until it became necessary to rub the worm against his lips for some time before he could decide about it. He would then take it and sit with his lips ajar for a short time, gathering strength and resolution, and then swallow by a desperate effort.

There is no telling what the number or result would have been, but the dinner bell rang as the 101st worm disappeared, and by the close of the meal he had retired to his den; nor did he appear for four days in his sunning place. It is to be hoped he slept well, but there may have been nightmares. J. C. HILL.

YELLOW SPRINGS, O.

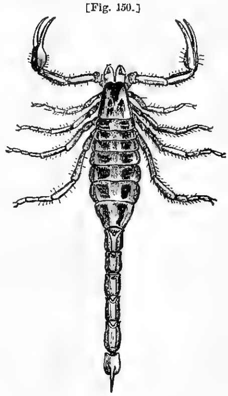
FOWLS VS. WORMS.—M. Giot, a French Entomologist, has lately found new employment for fowls. He says that French farmers have, during the past year, complained bitterly of the prevalence of worms, which infest corn and other crops, the highest cultivated fields being the most infested. Fowls are known to be the most indefatigable worm destroyers, pursuing their prey with extraordinary instinct and tenacity. But fowls cannot conveniently be kept upon every field, nor are they wanted there at all seasons. Therefore M. Giot has invented a perambulating fowl-house, which is described as follows: "He has large omnibuses, fitted up with perches above, the nest beneath. The fowls are shut in at night, and the vehicle is drawn to the required spot, and, the doors being opened in the morning, the fowls are let out to feed during the day in the fields. Knowing their habitation, they enter it at nightfall without hesitation, roost and lay their eggs there."

SOUTHERN NOTES.

BY J. PARISH STELLE, OF TENNESSEE.

Scorpions and Tarantulas in Tennessee.—A Canada Entomologist has written to ask if we have scorpions and tarantulas in Tennessee. I replied by letter, but thinking there may be others who would like the same kind of information, I have concluded to say, through the American Entomologist, that we have. We have two scorpions in the highlands of Tennessee: the "Long-tail" (*Scorpio* [*Telegonus*] *boreus*, Girard), and the "Short-tail" (*Buthus carolinianus*, Beauvois, Fig. 150). The sting of the former is, of the two, the most venomous, though neither is much to be dreaded. I would about as lief be stung by one of our scorpions as by a hornet. Length of body about one inch; color dirty greenish-yellow. The "Long-tail" is a shade darker than the "Short-tail." Our boys sometimes call them teetotallers, from the fact that they cannot endure alcohol. A drop of alcohol, or whisky, deposited upon one of them will cause it to immediately commit suicide by stinging itself to death.

[Fig. 150.]



Color—Brown.

As yet I have found but one species of tarantula in Tennessee, the *Mygale Hentzii* of Girard, which you figured on page 111 of your first volume. Tarantulas are very rare in Tennesse, owing, possibly, to the work of their deadly enemy, the Digger Wasp (*Pompilus formosus*, Say), which is quite plentiful here. Both scorpions and tarantulas increase in numbers as one goes down towards the sea-board.

Centipedes in Tennessee.—"If you wish to see the old fellow himself just open that!" said a friend the other morning, as he placed a small paper parcel upon my office table. There was no need of opening anything, however, for in the next instant out from among the folds of the paper, now freed from my friend's gripe, ran "the old fellow himself" in the person of a true Centipede about four inches long—the *Scolopendra heros* of Girard. One of my arms was resting upon the table at the time, and he made a sweep towards it as fast as his forty-two legs could carry him, having, doubtless, been favorably impressed with the cavernous appearance of my coat sleeve. I could discover nothing about him to make a favorable impression, especially when associating him with matters up my sleeve, consequently I made a sweep also—back from the table. And at all this my friend laughed most excessively. It was as good a thing as he wanted—"a worm putting an entomologist to rout"—until I had impressed upon him what the creature was, and assured him that its bite was almost as venomous as that of a rattlesnake. A sudden transit

"From gay to grave, from lively to severe,"

took place as he thought of the danger his fingers had lately been in, making altogether as good a thing as *I* wanted.

The Centipede was soon captured and bottled to the evident relief of my friend, who assured me that he had often met with them before without having the slightest suspicion as to their true character. He had regarded them as some kind of overgrown earwigs, and although he had heard of a terrible animal in Texas called a Centipede, the thought had never occurred to him that there was such a thing in Tennessee. Nor was he more ignorant in that particular than most of his neighbors: until I had found and recognized the creature, I do not think any of our citizens were aware of the fact that we had centipedes among us.

There are but few centipedes in Tennessee, and I think this point may be put down as about their northern limit. I found one ten miles above Savannah last summer, the furthest up that I have ever met with one. They are quite common in the Gulf States as we go down, however, increasing in number and size the further we go. Here they are small, four inches being about the greatest length to which they attain, but in the vicinity of Mobile I have found them over six inches long.

Nine-tenths of the stories told about centipedes are untrue. I do not regard them as being very dangerous at all. They *will* bite, and the bite is very poisonous, but you must confine or press them in some way to make them do it. A centipede in one's clothes or as a bed-fellow might not be just the thing to delight in, but there is little danger of their getting into such positions, for they abhor light or dry places. The greatest danger is to men handling old rails or pieces of wood that have lain upon the ground for a long time—they are likely to turn them up where they are plentiful, and, without due caution, may press them among their fingers. I have known fence-builders to be bitten by them.

The centipede never emerges into open day of its own accord, but lies under old logs and stones in damp places, whence it comes forth at night in quest of its prey. It is a ravenous eater, feeding on every character of soft insect that crosses its path, excepting earth worms—it appears to have no tooth for them. To give the general reader an idea of its appearance, I will say that it is a snuff-colored animal, from three to six inches long, and from one-fourth to one-half inch wide —something on the plan of a creature that everybody knowns as a "thousand-legged worm." It is divided into twenty-one joints, or parts, exclusive of the head, each joint bearing a leg on either side, giving it forty-two legs. The legs are divided into five joints, and taper rapidly to the extremities, finishing up in a kind of claw. The legs on the posterior part or joint do not run square out from the body like the others, but range back and turn in slightly at the ends, forming hooks. Upon its head it has a pair of long slender feelers, each divided into twenty-five joints, and also a pair of keen little forceps, or pinchers, which come out near the back part of the head, and form about two-thirds of a circle around it, meeting immediately in front, of course. The underside of the animal is flat, with a slight groove along the middle, while its back is inclined to roundish with two shallow depressions running its full length, or, rather, it is what would be called subconcave. Color of underside is a shade lighter than that of back.

We have, in the Southern States, several other members of the same family that might be mistaken for true centipedes; but there is a rule which will always enable one to identify them: the true centipede has forty-two legs running out from its body, while all its near though harmless relations have but forty.

Remedy for the Canker-worm.—At a winter discussion of the Iowa State Agricultural Society several gave their experience with the Canker-worm. Sorghum is cheaper than tar; besides, there is no danger of damage to the tree by using it, as there is with tar, if it is applied upon the bark. Thicken the sorghum with flour, and when the worms have covered it, kill them and daub on another coat.

My remedy was *burning* with a light coat of dry straw spread under the tree. Shake and pole the worms all off, and immediately set fire to the straw. Take a calm, clear day, and be careful not to burn the tree. S. Foster.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

The Striped Cucumber Beetle in a New Role—*Spring Bay, Woodford Co., Ills., May 3d*, 1870.—Enclosed I send some insects which I discovered, only a few days ago, on my pear and cherry trees, especially the former. These insects attack the blossoms of the pear, and also to some extent the cherry blossoms. Only six days ago, I discovered the first of these pests on my pear trees; at that time they were few in number, but to-day if a tree is shaken a cloud of them flies away, only to return again in a few minutes. I also send a few pear blossoms, in various stages of destruction. The insect seems to have a preference for the petals of the flowers, especially the yet unopened flowers, which they perforate first, and then eat all around until all or most of the petals are consumed. There are frequently two at work on one flower. Of cherry blossoms they seem to prefer the stamens of the fully developed flower, and I think that cherries are not as badly injured as pears. At least three-fourths of my pears are already destroyed by this destructive bug. I have dusted the trees with caustic lime, with sulphur, and sprinkled with water and coal oil, but without the least effect; they seem to be as regardless of all such things as the Colorado Potato Bug. I would be pleased to learn from you whether this is a new insect, or whether it is an old and well-known kind that has lately acquired bad habits.

J. G. Zeller, M. D.

[The insects are the notorious Striped Cucumber-beetle (*Diabrotica vittata*, Fabr., Fig. 151).

[Fig. 151]

Color—Black and yellow.

It has long been known to devour the leaves of a variety of different plants, early in the spring before cucurbitaceous vines have formed much leaf, but we never before heard of its injuring fruit trees to the extent you set forth. You will find it difficult to head them off, and we can recommend nothing with confidence, never having had an opportunity to experiment with them on trees. Wide mouthed bottles filled with sweetened water hung up in the trees, and fires built at night, might materially reduce their numbers, and should be tried another season. The beetles will leave the trees as soon as the cucumber and melon vines are out of the ground.—Ed.]

Larvæ in Human Bowels—*West Chester, Pa., April* 14, '70.—The article in the March number of the Entomologist on "Larvæ in the Human Bowels," brings forcibly to mind a case in point, which I will briefly relate. About the last of September, 1852, my little daughter, aged four years and a half, while on a visit to a friend, ate a large quantity of Catawba and Isabella grapes, from the vines in the garden, to which she had free access. A few days afterwards she was violently attacked with dysentery, from which she died in about three weeks. During her illness the motions from the bowels were frequently and critically examined by myself and another physician in attendance with me, *without detecting any larvæ.*

One year after interment, the old burial ground was required to be vacated, and the bodies were removed to a new cemetery. While superintending the removal of the remains of my child, I requested the undertaker to remove the lid of the inner coffin, and to my great amazement I beheld hundreds of dead and dried larvæ (such as represented in your Figure 93) adhering to the clothing and lining of the coffin. There were no evidences of the perfect fly, the larvæ seeming to have died while crawling about in vain efforts to escape. *I cannot be mistaken as to the larvæ,* as I particularly noticed the arrangement of the branchial spines on the sides and back of one, with a pocket lens, and as they had all died in an extended position, the two black hooks on the inferior surface of the head were plainly visible. Having paid some attention to entomology for some years previous, I recognized it as the larva of some Dipterous insect, with which I was unacquainted, and I wondered at their presence in such numbers, as the body was kept in a cold and darkened room, the weather being so cold at the time as to require fire throughout the house, and all flies having disappeared except the common House-fly. The conclusion at which I arrived at the time was, that the ova of these larvæ had been deposited on the body before interment. The question now arises, was the disease a symptom of the presence of these larvæ, and were the ova taken in with the fruit?

W. D. Hartman, M.D.

Beech-boring Larva—*Detroit, Mich., April* 9, 1870.—The accompanying rough sketch will give some idea of a boring lately observed by me in Beech-wood. I also enclose, in three distinct stages, the larvæ whose work this is. The general direction of these borings is almost always horizontal or at right angles to the grain of the wood, and frequently they are exactly parallel to each other as though laid off with mathematical precision. At first the passages are without the side branches or galleries, but after about the first inch, and sometimes before, these begin, as shown in my sketch, which is natural size. They are mostly at right angles to the mainway and perpendicular, or with the grain of the wood, and many of them are perfectly parallel to each other. I found but a single larva in each boring. This seems a remarkable amount of work for so small an insect, notwithstanding its powerful jaws. The earliest stage of the larva is found in the simple, the more advanced stages in the compound or branched passages. The character of this excavation, though, appears to depend much on the quality of the Beech. Where the wood is smooth and even the perforation is correspondingly straight and symmetrical, and the side chambers do not so soon appear, or not for at least an inch; but where knotty, wrinkled or contorted grain is met with by these little engineers, we find their work less regular and with more tortuous windings, the side chambers branching off sometimes at once in such cases. When encountering a knot or other similar obstruction they change their course in accordance, following the twisted grain on one side of it. Sometimes the excavations do not enter the solid wood immediately, but wind between it and the bark for a few inches. I have also observed some instances of three or more mainways leading off from one general entrance, at angles of about twenty degrees. The entrance, in the bark, is somewhat smaller than the interior, and is generally closed, being not easily perceived. These larvæ were taken from their excavations on the first of April.

On the ninth of April (this morning) I found several species of the beetle or perfect insect, some of which I also send herewith. These were usually in the small side chambers, but towards the entrance of the boring, as though making their way out. In two instances I took two of these beetles from a single chamber into which they were tightly wedged. They appear dormant at first, but afterwards are quite lively.

I do not send specimens of the borings from the fact that the first I found, and from which my drawing was made, were unfortunately not preserved by me, and I have since failed to obtain as fair specimens. Indeed, it is rather difficult to get them out without spoiling them. And in my eagerness to obtain the insects I was not as careful as I might have been to preserve their dwellings, which I generally had to destroy in order to get the inmates. So you will have to depend on my sketch in this respect. It gives a correct view (longitudinal sections) of one of two adjoining borings in a piece of smooth regularly-grained wood. HENRY GILLMAN.

[These larvæ are interesting from the fact that they evidently belong to a genus (*Colydium*) of beetles which have long been known to bore under the bark of trees in the larva state, but have never been described as boring in such a regular manner, the passages described by Mr. G. very closely resembling those of the Pine Timber-beetle (*Tomicus materiarius*, Fitch). We shall be glad to receive numerous living specimens of the larvæ and also specimens of the perforated wood, and hope that Mr. G. will make some effort to rear, or capture upon the tree, the perfect insect during the summer, as there are only three described N. A. species, the habits of none of which are known.—ED.]

PUPA OF THE GIRDLED SPHINX—*Vineland, N. J. April* 2, 1870.—Last fall there was brought to me the largest larva of some Sphinx I ever saw. It was almost black in color, and was without caudal horn. I think it would have weighed as much as a full grown specimen of the Royal Horned-caterpillar. To-day I unearthed it and found the chrysalis dead. The chrysalis is black, or nearly so, and about a third larger than that of the Tomato-worm moth (*Sphinx 5-maculata*). I cannot find anything in Morris's *Synopsis* that answers to a description of either the larva or chrysalis. I enclose the tongue-case, hoping you may recognize it by this.

MRS. MARY TREAT.

[From the description of the larva, and the character of the pupa tongue-case, the terminal half of which is curled up under the breast towards the head, we have little doubt that the insect is the Girdled Sphinx (*S. cingulata*, Linn.) which you will find described on page 188 of Morris's *Synopsis*, under the generic name of *Macrosila*, and where it is said to feed on Sweet-potato.—ED.]

TO KILL THE PEA-WEEVIL—*Vineland, N. J.*—I think I have a much better way of killing the Pea-weevil than Mrs. Chappelsmith. When I collect my seed I pour boiling water over them; this does not in the least injure the seed, and kills all the larvæ. But I do not see that there is much use in *one* person doing this, for my peas are generally stung from my neighbor's "bugs."

M. T.

NO APPLE PLANT-LICE—*Champaign, Illinois, May* 16, '70.—I have been unable to find a single specimen of *Aphis mali* this year, and do not believe that "scab" can be produced by it.

H. J. D.

THE PHILENOR SWALLOW-TAIL—ERROR CORRECTED—*Baltimore, Md., May* 14, '70.—Allow me to express my gratification at the improvement in the ENTOMOLOGIST by the addition of Botany. It is like a neat, well-cultivated patch of garden to a convenient dwelling-house, not rendering the latter more comfortable inside, but adding cheerfulness and neatness outside. I ought, however, to call your attention to an error which has crept into your columns. In your note on page 175, you say: "Mr. Parker has been led into error by the English rendering in Morris's *Synopsis*," "because Boisduval mentions no such character in the original French." Now, if I added without authority that the tail was whitish at base, it could not well be an "error in rendering," but an unwarrantable addition. Boisduval, in his *Species Général des Lépidoptères Diurnes* (Paris, 1836), when describing *Philenor*, does not mention the fact that the tail is whitish at base, but I did not translate my description from this book, but from Boisduval et LeConte's *Iconographie des Lépidoptères de l'Amérique Septentrionale*, where he says "les queues sont courtes, étroites, noires, bordées de blanc à leur base." Was I in error? Was not Mr. P. right? Are you not wrong?

DR. JNO. G. MORRIS.

[You are not in error; Mr. P. was right, and we are wrong—in part. Unlike the Pope, we do not claim infallibility, and it always gives us pleasure to have our mistakes corrected, especially when, as in this case, they question the accuracy of fellow-workers. We do not possess the work from which you translated, and as the description in the *Synopsis* is credited to "Boisduval" alone, and not to "Boisduval et LeConte," we made the unpardonable blunder of inferring that the description was condensed from the first mentioned work, which is the only one we know of by Boisduval himself, wherein *Philenor* is described. We were furthermore led into error by the description "whitish at base," instead of "bordered with white at their base," and would respectfully ask friend Morris whether there is not "*jest a leetle*" difference between the two phrases. In reality the tail is bordered more or less at base by the cream-colored sinuses each side, and so it is in almost all our different species of the genus *Papilio;* and yet their tails are not described as "whitish at base." We all slop over sometimes.—ED.]

A RARE CAPTURE—*Evanston, Ills., May* 17*th*, 1870.—Allow me to add to our Illinois Butterflies the beautiful *Limenitis proserpina*, Edwards. I have collected assiduously around here for three years, and never met with but one specimen. E. G. BOUTELL.

THE GRAPE-LEAF GALL-LOUSE—*Montpellier, France.*—Your remarks on page 248 of the first volume, in reference to the Grape-leaf Gall-insect are perfectly in concordance with the views of my brother-in-law, Dr. Planchon, and of my own. * * * You are perfectly right in your criticism of Dr. Shimer's new family, *Dactylosphœridæ*, as the globular hairs at the extremity of the legs are common to all *Coccus* and *Coccus*-like Leaf-lice, and *Phylloxera* stands very close to *Coccus*. J. LICHTENSTEIN.

DEVELOPMENT OF EGG OF IMPORTED CURRANT SAW-FLY (*Nematus ventricosus*)—*London, C. W., May* 11*th*, 1870.—I send you a small tin box, containing some eggs and a few young larvæ, just hatched, of *Nematus ventricosus*. I found them in the garden to-day, and hope they will reach you in good order. I observe that the freshly deposited eggs are much smaller than those from which the larva is about to proceed; but cannot see that they are attached to anything more than the mere surface of the ribs of the leaves. If this is the case, do the females use their saw-like appendage at all in connection with the depositing of eggs? The subsequent swelling of the egg must, I fancy, proceed altogether from the development of the enclosed larva. The texture of the enclosing membrane appears to be very elastic. WM. SAUNDERS.

A RARE CAPTURE—*Covington, Ky., April* 10, 1870.—The only notice that I have ever seen of *Phymaphora pulchella* is that in Packard's Guide, and from that I infer it is very rare. It may therefore be worth while to record the capture of a single specimen by me upon a plank fence around timbered land last summer. I do not remember the exact date, but I think it was about the last of April. It was left for some time among other material, and did not attract my attention until a short time ago.

V. T. CHAMBERS.

BEECH-NUTS IN COCOON OF THE CECROPIA.—In the last number of the AMERICAN ENTOMOLOGIST AND BOTANIST, mention is made of kernels of corn being found in the cocoon of the Cecropia. Two similar instances have come under my notice. Twice I have found beech-nuts in the inside of the cocoon at the small end, between the caterpillar and the innermost layer of silk. The explanation offered by Dr. LeBaron seems hardly admissible under these circumstances. [Why?] On the other hand, the fact of no beech trees being within an eighth of a mile, would indicate that they must have been placed there by the blue-jays, or some other bird, as he supposes. C. S. MINOT, in *Canadian Ent.*

THE WHEAT-BARBERRY RUST.

Says the *Country Gentleman:*

We have no controversy with the *Entomologist* on the scientific position it has taken on the fungoid parasites. The identity of the barberry rust and the wheat rust does not prove that the former plant causes the destruction of the wheat crop, any more than the identity of the apple and of the plum curculio proves that the apple destroys the plum tree.

The *Entomologist* has distinguished itself in exposing many popular errors, and in the last number mentions the common opinion at the South, that the hedge-hog caterpillar causes fever, because it is found in miasmatic localities; also, that of hair-snakes being water-soaked and animated hairs. It is precisely such hasty reasoning that induces many to believe that wheat turns to chess, and that the barberry bush rusts wheat. We admit that these two cases are unlike in character, but alike in the want of attempted proof, by close, accurate, repeated observation. The *Entomologist* is thoroughly scientific in its character, and we infer from its last article on this subject, that it only argues for the identity of the wheat and barberry rust, adding "we have never assumed that healthy barberry bushes, free from rust, will produce any rust in wheat." When it has furnished a series of close experiments proving that the barberry manufactures rust and then scatters it far and wide over wheat fields, we will accept the proof as far as it goes.

We would gently remind our contemporary that, in the first place, there is no identity between the Apple and the Plum Curculio, and, in the second place, if these two insects were identical, the analogy drawn in the first paragraph above quoted is a purely false and supposititious one. If there existed a curculio which in the larva state fed on apples, but which could only undergo its transformations to the pupa and perfect states in plums, such an insect might furnish the illustration required.

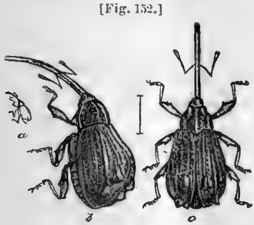
It does not become our Albany friends, after first criticising our position, to attempt to throw the burden of proof on us. We like not such modes of arguing a point. We have already furnished proof in support of our own position, and to deny in the face of it that barberry rust has any influence on wheat rust, is tantamount to denying, in the face of scientific evidence, that we derive the tape-worm from the *cystadids* which inhabit the liver and other parts of the hog. Until this last fact was proved by experiment, few could comprehend or imagine that we derived that dreaded parasite from one of our most common domestic animals; and though it may be equally difficult for some persons to comprehend how the pregerminal form of a parasitic plant may be wafted hundreds—nay thousands—of miles from its place of development; or how it may be almost ubiquitous, and yet remain latent indefinitely, and not continue its destined course of growth until the requisite conditions present themselves—yet such we believe to be facts, nevertheless.

We rest the matter here, for it does not belong to our columns; and we are perfectly willing that the reader shall form his own conclusions as to which of us founds his faith on assumption, and which on close experiment.

THE APPLE CURCULIO.

In order that our readers, and especially those who live near St Joseph, Mich., may recognize the Apple Curculio whenever they see it, we present herewith its portrait (Fig. 152), *a* giving

[Fig. 152.]



Colors—Dingy gray, inclining to rust-red behind.

the natural size; *b* a side view, and *c* a back view. Now compare this figure (*b*) with that of the Plum Curculio (Fig. 92, *c*) on page 130 of this volume, and it will be next to impossible to confound two such widely differing insects.

THE NEW CURCULIO REMEDY.

As we always like to give a good reason for the faith that is in us, it will be well, perhaps, to report the results of experiments recently made to test the chip-trap Curculio remedy. On the 16th of May, at Kirkwood, Mo., we carefully cleared the ground around six stone-fruit trees (two peach, two plum and two cherry). We cleared it within a radius of at least four feet around each tree; and after depositing the requisite traps, and carefully examining them three times a day till the present time (May 29th), how many Curculios, good people of St. Joseph, do you suppose we captured? Just SEVEN, namely, two on the 20th, one on the 21st, one on the 22nd, one on the 25th, and two on the 26th. Not very rapid catching, but all we expected at this season of the year!

ERRATUM.—Page 211, column 1, line 20 from bottom, for "as" read "and."

☞Where there is one thorough entomologist among our readers, there are doubtless a hundred persons who know next to nothing of Entomology, and who do not understand the technicalities of the science. For this reason we always endeavor to evade such technicalities, as far as is consistent with clearness and precision, knowing full well that plain Anglo-Saxon is best understood by all.

☞Our labors have lately been interrupted by a rather tedious illness, and our correspondents will please bear with us for any delay in attending to their questions.

☞Our readers will greatly oblige us by addressing all letters of a botanical character to the botanical editor, as we have nothing to do with the botanical department.

ON OUR TABLE.

A PRELIMINARY LIST OF THE BUTTERFLIES OF IOWA. By Saml. H. Scudder, Chicago Academy of Sciences.

THE TECHNOLOGIST. Industrial Publication Co., 176 Broadway, N. Y.

ZYMOTECHNIC NEWS. St. Louis.

MONOGRAPHIA CHALCIDITUM. Vols. I and II. By F. Walker, British Museum.

THE APICULTURIST. Mexico, Mo.

THE COSMOPOLITAN. New York.

TROUT CULTURE. By Seth Green. D. M. Dewey, Rochester, N. Y.

OHIO CONVENTION REPORTER. Columbus, O.

THE HUB. Boston, Mass.

ADVERTISERS' GAZETTE. Geo. P. Rowell & Co., N. Y.

PROCEEDINGS OF THE ILLINOIS PRESS ASSOCIATION, at its Fourth and Fifth Annual Meetings. Hamsher & Mosser, Decatur.

PREMIUM LIST OF THE FOURTH ANNUAL FAIR OF THE NEBRASKA STATE AGRICULTURAL SOCIETY.

BOWDOIN SCIENTIFIC REVIEW. Brunswick, Me.

MASONIC TROWEL. Springfield, Ills.

EUROPEAN MAIL.—London, Eng.

LAND AND WATER. London, England.

NATURE. London, England.

TRANSACTIONS OF THE CHICAGO ACADEMY OF SCIENCES. Vol. I., part 2.

THE SOUTHERN AGRICULTURIST. Published by Thomas J. Key. Louisville, Ky.

OUTLINES OF BEE CULTURE. Second edition, with additions and illustrations. By D. L. Adair.

ANNUAL REPORT OF THE REGENT OF THE ILLINOIS INDUSTRIAL UNIVERSITY.

FORSYTH BANNER. Forsyth, Mo.

PHYLLOXERA VASTATRIX. Par le Dr. V. Signoret.

MEMORIAL OF HERMAN TEN EYCK FOSTER; OF BENJ. P. JOHNSON, and RATIONAL AND IRRATIONAL TREATMENT OF ANIMALS. Three pamphlets from the New York State Agricultural Society.

ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

Tarantula of Texas—*L. J. Stroop, Waxahachie, Ellis Co., Texas.*—You ask whether the outline of the cephalothorax is correct, and the ocelli properly placed, in the figure of the Tarantula (*Mygale Hentzii*, Gir.), which we published on page 111 of our first volume; and you state that, if the figure is correct, there must be two species, as the one occurring in your locality differs from the figure, especially in having the ocelli arranged around a small circular disk, or sessile style. We do not think there are two distinct species, for our figure, which was borrowed from the *American Naturalist*, is not very correct in these points; and three Missouri specimens which we have in our cabinet, all agree with your description.

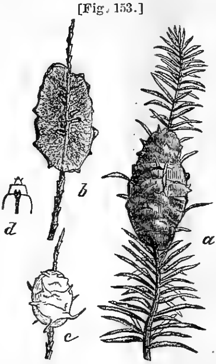
Insects of Colorado—*M. W. H., Ann Arbor, Mich.*—Descriptions of the Beetles of Colorado have been given by Dr. Jno. L. LeConte, in the Proceedings of the Philadelphia Academy of Natural Science.

Ailanthus Silk-worm Naturalized—"MUCH ADO ABOUT NOTHING"—*A. S. Fuller, Ridgewood, N. J.*—The cocoons found on Ailanthus in Brooklyn, the worms of which were very numerous last season, so that the "Tree of Heaven," though long exempt, has at last become the food of worms, are actually those of the Ailanthus Silk-worm (*Attacus cynthia*, Hübn.) It was introduced into this country in 1861, and has been fully experimented with since then. Dr. Morris of Baltimore published elaborate papers on the culture of this worm in the Patent Office Reports for 1861-2, and five years ago we made extensive experiments with it, and then and there stated our belief that its cocoon was of no more value than that of some of our native silk-worms.* The Ailanthus worm has since become wild, and is rapidly increasing around the cities of Baltimore Philadelphia, Chicago, and, as it now appears, around Brooklyn. And yet a certain Prof. J. Q. A. Warren, who seems to have a sort of seri-mania, is now traveling over the country, and delivering, with an appearance of originality, to the scientific academies of our principal cities, the same lecture which he delivered, some time since, before your Farmers' Institute Club—totally ignoring what has been done in past years, and soliciting government aid in the introduction of this worm. If this should meet the Professor's eye, he will know that the Ailanthus worm takes kindly to our climate without legislative aid. We would also suggest to him that he had better first post himself as to what has been done abroad by such men as Guérin Méneville, and would ask him whether he thinks it worth while to preach so loudly, after the French have tested this insect so thoroughly without any good result?

Prairie Farmer, April 18th, 1866.

Cypress-gall—*J. P. S., Savannah, Tenn.*—The gall which occurs on the stems of the Cypress tree, so abundant in your swamps, is produced by a little gall-gnat (*Cecidomyia*), and as the gall is undescribed, we represent it at Figure 153, *a* giving the more common form; *b* a section; *c* a more exceptional form, and *d* the magnified head, showing breast-bone of larva. From its resemblance to a miniature pine-apple, it may be called the Pine-apple Cypress-gall, and we subjoin the following description of it and its architect:

[Fig. 153.]



GALL (*Cupressi ananassa*, N. Sp.)—Growing on the stems of the Cypress tree (*C. thyoides*). A pale brown gall, sparingly covered with a pruinescence, averaging over half an inch in length, with numerous transverse, knife-edged elevations, and in form and general appearance recalling a pine-apple; some specimens are smaller, more spherical, and recall the appearance of an Early Rose potato. Evidently an enlargement of the stem, the elevations corresponding to the leaf-scars. A transverse section shows the woody part of the stem through the axis of the gall, and around it are arranged from three to eight larvæ, lying in the spongy mass which forms the interior of the gall, and which has the exact golden-brown color, and very much the appearance of spunk.

CECIDOMYIA C. ANANASSA, N. Sp.—*Larva*—0.07 long; deep orange, with a rather distinct lateral ridge, and with the breast-bone clove-shaped, and very dark brown—almost black.

Pupa—Unknown.

Pupal integument—Non-characteristic; silvery-white, with antennæ slightly brown; remains attached to outside of gall.

Imago—♀ 0.05–0.06 inch long, exclusive of ovipositor, which, when fully extended, is as long as abdomen. ♂ 0.04–0.05 inch long. Color bright blood-red. Antennæ brown, the two basal joints pale red; those of ♀ 14-jointed, with joints 1 and 2 twice as stout, but together only as long as 3; 3–14 very gradually less and less, each twice as long as wide, slightly constricted in middle, with short whorls and short pedicel; joint 14 with a terminal bud: those of ♂ also 14-jointed, with joints more constricted, whorls, which are rather longer than diameter of joint, somewhat more conspicuous, and pedicels longer. Head above and at sides black, with jet-black eyes. Thorax dusky superiorly, pale red laterally and beneath. Abdomen bright blood-red, verging to scarlet. Legs dusky, with basal half of thighs and thochanters paler. Wings smoky. The whole body and legs with numerous hairs, and the wing-fringe long. Bred many specimens which commenced issuing April 25th, and are still (May 15, '70) issuing, while some galls yet contain larvæ. Described from 3 ♂ 3 ♀. Easily recognized by its small size and bright red body, in contrast with the black head and dusky thorax above—the red color being retained even in the dried specimens.

Insects Named—*Chas. S. Davis, Decatur, Ills.*—Your insects are: No. 1, pupa of *Arctia virginica*; No. 2, Dried larva skin, containing a 4-winged parasite which we have often bred and which belongs to the genus *Rogas*, but is undescribed; No. 3, *Arhopalus robiniæ*, Forster; No. 4, *Lachnosterna quercina*, Knoch; No. 5, *Euryomia inda*, Linn.; No. 6, *Elaphrus ruscarius*, Say.

Tent-caterpillar of the Forest—*A. M. Brown, Villa Ridge, Ills.*—The worms which have infested your plum, apple, and several forest trees, are the above named insect (*Clisiocampa sylvatica*, Harris). It hatches at about the same time of year as does the common Orchard Tent-caterpillar (*Cl. americana*), matures at the same time, and spins a cocoon almost identically similar; but besides the difference in the markings mentioned on page 208 of our first volume, it differs from the other species in the following essential points: It is a more indiscriminate feeder, attacking alike many forest as well as orchard trees, and is more apt to become excessively numerous in certain years, and to swarm like the Army-worm, wherefore it has been erroneously called THE Army-worm in some parts of New York. It spins a much less conspicuous web (sometimes fastened to the limbs so closely that it is not readily perceptible) and congregates on the outside of it, especially at the different moulting periods, when large companies may often be found huddled together, and easily destroyed. It loses its gregarious habit much earlier, or when about half grown, and travels rapidly from place to place in search of proper shelter to spin its cocoon. Its egg mass is of a uniform thickness, and is docked off squarely at each end.

John H. Evans, Des Arc, Ark.—The worms which are scattered all over your part of the country, and which completely stripped the over-cup timber in the overflowed bottoms, both last year and this, are the same Forest Caterpillars mentioned above. As they have been very numerous this season, we have concluded to publish a more full account of them in our next issue. Your informant, in stating that this worm also devours the Cotton plant, must, we think, have confounded it with the Cotton-worm (*Anomis xylina*, Say).

Worm boring into Peach—*W. C. Flagg, Alton, Ills.*—The pale green worm, with cream-colored specks, and a broad cream-colored lateral band, and which you found inside a peach, produces an undescribed moth, of an ash-gray color, belonging to the genus *Xylina*. We have for several years been acquainted with this worm, and have found it in apples, peaches, oak-galls, on hickory leaves, and on other forest trees. It has never done much damage to fruit. We shall shortly figure the moth.

A. C. Hammond, Warsaw, Ills.—The worm boring into your apples is the same as that mentioned above.

M. M. Hooton, Centralia, Ills.—You will also recognize him as the gentleman boring into your peaches.

Insects Named—*A. Engelman, Shiloh, Ills.*—The two tree-hoppers which you found together on one of your vines, are not of the same species. The golden-green species with the back compressed, thin-edged, rounded, high and arched anteriorily, like the edge of a shoe-knife, may be known as the Golden-green Vine Hopper (*Smilia auriculata*, Fitch). The brown species with a camel-like hump on his back is the *Membracis ampelopsidis* of Harris. Both species are common on grape-vines. The rough beetle is ♀ *Trox punctatus*.

Lice on "Snow-balls"—*Mrs. C. L. Seymour, Chicago, Ills.*—Give your shrubs frequent syringings of tobacco-water, or of a weak solution of cresylic soap, especially when the lice first appear.

Insects Named—*T. P., St. Louis.*—Your insects are: Nos. 1 and 2, *Leucania unipuncta*, Haw. No. 3, *Geometer*, unknown. No. 4, *Desmia maculalis*, West. No. 5, *Phacellura hyalinitalis*, Linn. No. 6, *Plusia simplex*, Guenée. No. 7, *Pamphila oileus*,* Linn. No. 8, *Depressaria* ———? No. 9, *Pamphila phyleus*, Boisd. et Lec. No. 10, *Aspila subflexa*, Guen.* No. 11, *Passalus cornutus*. No. 12, *Argynnis columbina*, Godt. No. 13, *Cycocephala immaculata*, Oliv. No. 14, *Pelidnota punctata*, Linn. No. 15, *Glocopis semidiaphara*, Harr. No. 16, *Horinus lævis*, Oliv. No. 17, *Catocala amatrix*. No. 18, *Phyllophaga quercina*, Knoch. No. 19, *Cucujus clavipes*, Oliv. Nos. 20 and 21, *Clytus scutellaris*, Oliv. No. 22, *Harpalus caliginosus*, Fabr. No. 23, *Paphia glycerium*, ♂. No. 24, *Acridium americanum*, Drury. No. 25, *Priononyx Thomæ*, Fabr. No. 26, *Grapta interrogationis*, Fabr. We should like duplicate specimens of those marked with a *.

Twig Borer—*S. H. Kriedelbaugh, M. D.*—The insects which were boring into your grape cuttings, and which entered at the axil of a bud, are the common Twig-borer (*Bostrichus bicaudatus*, Say), repeatedly referred to in back numbers under this name. We repeat the annexed cut (Fig. 154), 5 giving a side view of ♂, and 6 a back view of ♀. We found a ♂ and ♀ in each of the cuttings you sent.

[Fig. 154.]

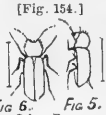


FIG 6. FIG 5.
Color—Brown.

G. F. Merrium, Topeka, Kansas.—Your insect boring grape canes is the same Twig-borer. It is an old enemy.

Preserving and Mounting Beetles—*G. C. B., Lawrence, Kansas.*—Beetles to be sent away can be well kept in alcohol. Entomological pins can be obtained in Philadelphia, as per advertisement on our cover. Be sure and order the Klaeger pin, made in Berlin; else they will send you a worthless pin of American make, which in quality, strength and finish is as inferior to the genuine Prussian article as a squash is to a pine-apple in flavor.

Bee Enemy—*F. Brewer, Waynesville, Mo.*—The insect which you sent and which you caught with a bee, is not the same bee-enemy which you sent last fall, and which we referred to on page 59. That which you now send is the Spotted Rove-beetle (*Staphilinus maculosus*, Grv.), an insect of scavenger habits, and which would be more likely to devour a dead than a living bee.

Orange Raspberry Rust—*Isidor Bush, Bushberg, Mo.*—The bright orange rust which is entirely covering the underside of the leaves of many of your raspberry bushes, is the Orange Raspberry Rust (*Uredo ruborum*). Knowing that you have the back numbers of our magazine, we refer you to what was said about this fungus on page 238 of our first volume. There is no other available remedy than the complete destruction, root and branch, of every infected plant, and unless this remedy be unhesitatingly and thoroughly applied, you may expect in a few years to lose your whole raspberry plantation. Several other subscribers have lately sent to us this same fungus, which seems to be on the increase. This answer will suffice for all.

How to Kill Insects—*W. M. Grant, Davenport, Iowa.*—You will find the information you want on page 199 of our last number.

Knots on Apple-tree roots, caused by Root-lice—*B. N. McKinstry, East Sumner, Ills.*—The knots on the roots of your one-year old apple root grafts are undoubtedly the effect of root-lice punctures. The fact that they occur only on those grafts which you bought, and not on those which you yourself grafted, would indicate that the grafts were infested in the nursery from which they came. These knots, as well as the roots upon which they occur, will eventually rot, and most of the grafts—not all—will die. There were no lice on those you sent, but if lice still exist in your nursery rows, their presence will be made manifest by the bluish-white down which they secrete. Either root up such infested grafts and destroy them, or try and save them by removing the earth and applying hot-water. In a recent article, the Horticultural Editor of the *Prairie Farmer* (P. F. May 7, '70), states that hot-water cannot possibly be of any practical use, but this statement, like one or two others in the same article, is made without sufficient deliberation. It will hold good in reference to large, deep-rooted trees, but we know, from experiment, that hot-water is the best remedy that can be used against these lice in the nursery, where the greatest damage is really done. Be cautious next time, and inspect your grafts before planting.

Beetles Named—*W. W. Daniells, Madison, Wis.*—The smaller beetle which you send is the common Twig-borer (*Bostrichus bicaudatus*). The large gray snout-beetle found eating the apple leaves off just at their base, is the New York Weevil (*Ithycerus noveboracensis*, A. E., Vol. I, Fig. 157). The Missouri Reports are sent postage free for the price advertised on page 179 of the present volume.

Bag-worm—*M. M. Hooten, Centralia, Ills.*—The worms which you found on your peach trees, and which "carry their houses on their backs and stand on their heads," are the young larvæ of the common Bag-worm (*Thyridopteryx ephemeræformis*, see p. 35). As they grow older they will let their houses hang down.

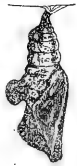
The Larder Beetle—*Dr. S. H. Kriedelbaugh, Wis.*—The brown hairy larvæ which taper from head to tail, and which are furnished with two short, curved, horny spines on top of the last joint, are the larvæ of the common Larder Beetle, also often called the Bacon Beetle (*Dermestes lardarius*). We never knew them to occur before in bee hives; but, as they feed on feathers, horn, hoofs, and other such (to us) indigestible substances, it is not surprising that they also relish wax. Those you sent fed ravenously upon it; and, after changing their coats several times, became beetles. The beetle measures about 0.30 inch in length, and is dark brown, with a characteristic pale yellowish-brown band containing six black dots across the upper half of the wing-covers.

Water Bug—*Wm. H. Harrington, Clinton, Iowa.*—The long-bodied, brown water insect, with two long but stiff tail appendages, and with the front pair of legs somewhat resembling the front arms of the Rear-horse (*Mantis*), is the Dusky Ranatra (*Ranatra fusca*, Beauv.) It is tolerably common, and dashes with rapid and sudden jerks over the surface of the water.

Katydid Eggs—*Jason Owen, Elkhart City, Ills.*—The eggs you send are those of the Oblong-winged Katydid. (See A. E., I, Fig. 120.)

Gregarious Worms on Horse Chestnut—*Wm. R. Howard, Forsyth, Mo.*—The worms on Horse Chestnut are, as you suggest, the larvæ of *Tortrix Rileyana*, figured and described in your First Entomological Report. The eggs are deposited on the leaves. Yes, it has a parasite, for we have bred an undescribed species of *Microdus* from it.

[Fig. 155.]



b

Pupa of the Disippus Butterfly—*Tyra Montgomery, Mattoon, Ills.*—The curious brown and cream-colored pupa (Fig. 155), with a strange knife-edged projection that is often likened to a Roman nose, is the pupa of the Disippus Butterfly (*Limenitis disippus*, Godt.) The butterfly is represented at Figure 133 of our first volume, and is a tolerably common species. The larva feeds on willow and cottonwood, and passes the winter in a snug little retreat formed by part of a leaf.

Prickly Rose Gall—*J. Cochrane, Havana, Ills.*—The round prickly protuberances found on a wild rose, are galls made by a four-winged fly belonging to the genus *Rhodites*, and first described by Harris under the specific name of *bicolor*.

J. P. S., Tenn.—The green prickly galls with a beautiful rosy tint, found so common on one of your wild dwarf roses, are the same as that mentioned above.

Insects feeding on Sap of Black Walnut—*Dr. M. Barrett, Waukesho, Wis.*—Yes, the flies you send belong to the genus *Psocus*, and are the common *venosus* of Burmeister.

Locust Borer—*"Arbor," Columbia, Mo.*—The borer you refer to is undoubtedly the common Locust Borer (*Arhopalus robiniæ*). To prevent its attacks apply soft soap to the trunks of your young trees every summer about the first of August.

To Exterminate Cockroaches—*R. F. Weitbree, Birmingham, Ohio.*—Use pulverised borax, and sprinkle freely in their haunts. It is harmless to the higher animals.

TAKE 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, 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 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.

☞ Our readers will confer an especial favor by addressing all letters of a business character to the publishers, as the editor has no time to attend to such letters.

DRAUGHTSMAN WANTED.

We can give employment to a good Draughtsman, and especially to one who has a taste for the study of Entomology, and is desirous of improving his knowledge in this department of Natural Science. None but those who have had practice in drawing minute objects need apply. For particulars and terms address the editor of this department.

Wanted.—We are desirous of obtaining living larvæ of *Attacus luna* and *promethea*. Can any of our entomological friends furnish them?

Coleop. & Lep.

Botanical Department.

DR. GEORGE VASEY, EDITOR, Richview, Ills

THE LEAF AS A WORKER.

BY DR. J. A. SEWALL, NORMAL, ILLS.

We boast of our rich soil, of our magnificent forests, of our monster crops, of our vast deposits of coal that energizes machinery in a thousand ways, but where is the worker that made for us this deep, rich alluvium—these vast crops of corn and wheat—that covered the plain with the luxuriant grass and beauteous flowers—that builds up the great forests—that made the inexhaustible coal beds? Where is the maker of all these? Can the chemist determine? Can the philosopher tell us what, and when, and how? Have these privileged interrogators of nature seen and *known?* We have *all* seen; we may *all know.*

The green leaf is the laborer, the worker. And looking out upon the face of the broad earth, there is not a tree or shrub, from the gigantic cedars of California to the most delicate moss cup, but has been built up by this green leaf. Away down the ages, anticipating man's wants, it has built up, and stored away in the caverns of the earth, the coal that cheers our homes—that urges the steamship through the storm and wave—that drives our locomotives with fearful speed over the continent—that energizes machinery in a thousand forms, and for a thousand ends, in our great manufactories. More than this, the whole animal creation depends for its existence, directly or indirectly, upon this apparently feeble instrument—this fragile agent. Utterly destroy the whole human race—let it be annihilated from the face of the earth—and the course of nature need not necessarily be radically changed—a little readjustment, a little reconstruction, would be all that is necessary.

But strip from the tree and shrub and herb the leaf (the trees and shrubs themselves may be left untouched), and the *whole organic world* would be utterly, completely destroyed. No beast would walk the plain or roam the forest—no bird float in the air—no fish would people the ocean, or lake or stream—no insect hum—no verdure bloom. The streams even would be dried up, and the broad earth's face would be one vast desert. The organic would die, and naught be left but the dead, pulseless, *inorganic world*—even as it was myriads of ages ago, at the evening of the second day.

Verily the green leaf is the *Alma Mater* of the organic world.

The leaf supplies us with food, with material for covering (you know our first parents made a short shift to accomplish this), and it pumps up the water from the earth and sends it down the mountain sides in cooling streams, and waters the broad plain, and gives drink to the thirsty. It furnishes us with the very air we breathe.

How passing strange! The locomotive, that mighty beast, with nerves of steel and sinews of brass, plunging through the forest, thundering over the plain, with a rush and roar, while the leaf sways and trembles at its approach, though it made, wrought out, the very fuel that gives it *power*. The rain that falls in plenteous showers, refreshing the earth and gladdening the husbandman, was drawn up from the nether earth, and sent out into the ethereal medium, in particles so small, that the eye could not see them—so subtle that even gravity could not seize on and hold them. The food we eat, whether animal or vegetable, the leaf has elaborated for us, and our dress, whether it be of cotton or wool, or the skins of beasts, the leaf has woven for us. The air we breathe was prepared for us by this little leaf. But these are only assertions. Tell us how the leaf works.

Let us, then, consider the leaf as a *worker*. Let us learn *what* it does, and *how* it does it. In the first place, let us fully understand what we mean by *worker*—or let us agree as to the definition of the term. To illustrate, we say of the locomotive, that it performs a certain amount of labor, it turns so many wheels, drives so many looms, draws so many cars so many miles an hour—we speak of it as a worker. So, too, of man—we speak of him as a worker. He performs so much labor, physical or mental. Yet the locomotive, with all its ponderous bars, its mysterious valves, its great levers, its hidden springs, can do nothing. It is dead, inert metal. True, too, of man—that wonderful combination of bones and muscles and nerves and tissues—can do nothing—but decay, and be resolved to dust again. The brain cannot think, the eye cannot see, the ear cannot hear, the nerves cannot thrill, the muscle cannot contract.

In the *same sense* the leaf can do nothing. Yet in the *same* sense, that a locomotive can draw a train, or that man can think, and labor, is the *leaf* a laborer that outworks them all. The locomotive is a combination of material things so arranged that through or by them, we discover the operations of force. Man himself is nothing more. The leaf is the same. Better, perhaps, that we say that these are the *workshop*, wherein force exhibits itself, and produces results. When did the leaf begin its work? It was the *first* to rise on creation's morn and go forth to labor. Ere the almost shoreless ocean dashed upon the low Silurian plain, the leaf was at its work. And through all the long ages it has worked—worked to develop better and higher forms of life. And the earth's broad face is written all over with the evidences of its faithfulness.

Now, what does it do? It pumps water from the ground, through the thousands of tubes in the stem of the tree (the tubes which itself has made), and sends it into the atmosphere in the form of unseen mist, to be condensed and fall in showers. The very water, that, were it not for the leaf, would sink in the earth, and find its way perchance through subterranean channels to the sea. And thus it is that we see it *works* to give us the "early and the latter rain." It works to send the rills and streams, like lines of silver, adown the mountain and across the plain. It works to pour down the larger brooks which turn the wheel that energizes machinery —which gives employment to millions. And thus a thousand wants are supplied—commerce stimulated—wealth accumulated—and intelligence disseminated through the agency of this wealth. The leaf does it all.

It has been demonstrated that every square inch of leaf lifts three five-hundredths of an ounce every twenty-four hours. Now, a large forest tree has about five acres of foliage, or six million two hundred and seventy-two thousand six hundred and forty square inches. This being multiplied by three five-hundredths (the amount pumped by every inch) gives us the result—two thousand three hundred and fifty-two ounces, or one thousand one hundred and seventy-six quarts, or two hundred and ninety-four gallons, or eight barrels. A medium sized forest tree, about five barrels. The trees on an acre give eight hundred barrels in twenty-four hours. An acre of grass, or clover, or grain, would yield about the same result.

The leaf is a worker, too, in another field of labor, where we seldom look, where it exhibits its unselfishness—where it works for the good ot man in a most wonderful manner. It carries immense quantities of electricity from the earth to the clouds, and from the clouds to the earth. Rather dangerous business, transporting *lightning*. I think it would be considered contraband by the "U. S.," or "Merchant's Union," or any common carriers: but it is particularly fitted for this work. Did you ever see a leaf entire as to its edges? It is always pointed, and these *points*, whether they be large or small, are just fitted to handle this dangerous agent. These tiny fingers seize upon and carry it away with ease and wonderful dispatch. There must be no delay; it is "time freight." True, sometimes it gathers up more than the *trunk* can carry, and in the attempt to crowd and pack the baggage the trunk gets terribly shattered, and we say that lightning struck the tree. But it had been struck a thousand times before. This time it was overworked.

As we rub a stick of sealing-wax or a glass tube with a warm silk handkerchief, so the air is always rubbing over the face of the earth with greater or less rapidity. And what a huge electrical machine! But be not afraid, the leaf will see that it is taken care of. As we guard our roofs from the destructive action of lightning—dashing to the earth—crashing, rending, burning on its way—by erecting the lightning rod, whose bristling points quietly drain the clouds, or failing to do this, receive the charge and bear it harmless to the earth—so God has made a living conductor in every pointed leaf, in every blade of grass. It is said that a common blade of grass, pointed by nature's exquisite workmanship, is *three times* as effectual as the finest cambric needle; and a single *twig* of leaves is far more efficient than the metallic points of the best constructed rod. What, then, must be the agency of a single forest in disarming the forces of the storm of their terror.

Nature furnishes the lightning, and it furnishes the lightning rods. Take a hint, then, and plant trees.

PRESERVATION OF FOREST TREES.

It should be an object with us to preserve, in our villages, towns and cities, specimens of the native forest trees. If those having the care of public grounds would give a little attention to this subject, much beauty and interest would be added to these places. Even the rows of trees along the streets of our towns and cities might be made to represent the ancient forest, now rapidly being defaced and swept away by the all-devouring axe. What lasting beauty and variety would thus be secured for those grounds and streets! A public square filled mostly with trees of any single species, is a beautiful object; but how much more beautiful and interesting it would be if it contained sixty different trees, and an undergrowth of handsome and ornamental shrubs. Such places would at once give character to the locality, and attract to it people of taste and refinement.

J. A. Lapham.

THE OAKS.

The genus *Quercus*, which embraces the Oaks, is very widely diffused over the countries of the Northern Hemisphere. Different countries vary much in the number of species which they produce. Thus, in the British islands, there are but two species; one with sessile or stalkless acorns (*Quercus sessiliflora*, Salisb.), and the other with acorns on a stem or peduncle (*Q. pedunculata*, L.) Indeed, these two forms have by some botanists been considered as but varieties of one species (*Quercus robur*).

The countries of Northern Europe are mainly limited to these two forms, but in France, Spain, and the Mediterranean States, several other species are introduced. New species occur again in Asia Minor, Koordistan, the Himalayas, Eastern Asia, and the Indian islands, so that some two hundred species have been described in different parts of the world.

The North American Oaks are a very interesting group, and include a large number of species, each having a more or less extensive range. In the district east of the Rocky Mountains we have about twenty species; new ones occur in Texas, Mexico and California.

The different kinds of Oaks manifest a disposition to hybridize quite freely, so that we frequently meet with intermediate forms which are quite puzzling.

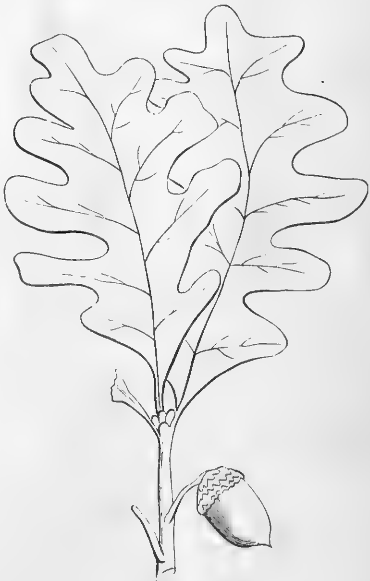
We propose to give, in a series of articles, an account of the Oaks of this country, illustrated in most cases by such figures as may help our readers to a determination of the various kinds they may meet with.

The principal characters of the genus are mainly as follows: Trees or shrubs, with alternate leaves, and with sterile and fertile flowers separate; the sterile ones on slender, thread-like, drooping stems; the fertile ones small and inconspicuous, consisting of a three-celled ovary, enclosed by a scaly covering, which when enlarged becomes a kind of cup to contain the fruit or acorn. Although the ovary is at first three-celled, with two ovules in each cell, yet but one of the ovules is fertile, and that enlarges to fill the whole cavity.

All our species of Oaks are divided into two sections, distinguished by the time occupied in the full development of the fruit, viz: first, those which mature the fruit in one season; and second, those whose fruit is two years in acquiring maturity. The first section includes the White and Chestnut Oaks, also the Live Oak of the Southern States. Of these the leaves usually have blunt lobes, and the acorns are sweet or sweetish, and some of them edible. In this section the acorns are produced on the new twigs, and are generally more or less stalked. In the second section the leaves are either entire, or lobed and bristle-pointed; the acorns are bitter, and are matured on the twigs of the last season, and below the new shoots. This section includes the Red and Black Oaks, the Spanish and Pin Oaks, and the Willow-leaved Oaks.

We present in this number the White, Bur, and Post Oaks, belonging to the first section.

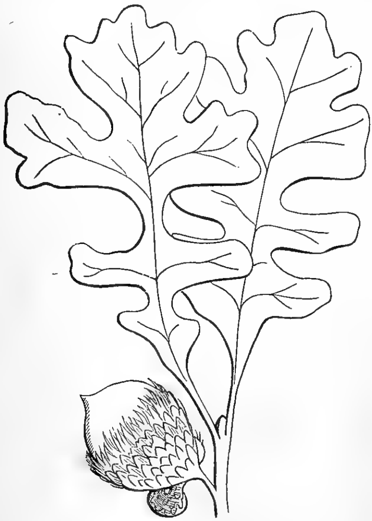
[Fig. 156.]



White Oak—(*Quercus alba*, L.)

The White Oak is one of our largest and most valuable forest trees. It is found in almost all the wooded portions of the country, particularly on uplands and hills. Its wood is compact, white, strong and durable. The bark of young trees is smooth and whitish, on old trees it is somewhat furrowed and roughened, but still of a light ash color. The leaves present considerable diversity both in outline and in the number and depth of the side lobes. They are usually oblong, when mature five or six inches long, and more than half as wide; with from three to six oblong, obtuse lobes on each side, the middle ones longest, the divisions extending sometimes half way, and sometimes nearly to the middle, and sometimes again partially divided with smaller lobes. They are whitish or pale on the under side, bright green and smooth above, generally wedge-shaped at the base, and with short stalks, seldom over half an inch long. The cup is deep, saucer-shaped, roughened, and enclosing about one-third the acorn, which is smooth, oblong, and about two-thirds of an inch long. The fruit is usually short stalked, frequently two from the same stalk.

[Fig. 157.]



Bur Oak, Overcup Oak—(*Quercus macrocarpa*, Michx.)

The Bur Oak, or Overcup Oak, is mainly a native of the Mississippi valley, extending sparingly into some of the Eastern States. It is a large tree, of irregular shape, with long angular limbs, and bark rather rougher and darker than the White Oak. It is the principal tree of the oak openings of the Western States, in which situations the wood is coarse grained and brittle; but when growing in a dense forest the tree is more regular in shape, and the timber of a better quality. The leaves are obovate in outline, broad at the top, and narrow at the base, with three to five lobes on each side, the lower ones small, and the divisions reaching nearly to the midrib, the upper ones longer and broader. The under surface is white with a fine down, the upper surface glossy green. They are narrow, wedge-shaped at the base, and with stalks an inch or more in length. The acorn is roundish, about an inch long, and usually nearly enclosed by the cup, which is deep, and externally rough, with pointed scales, at the edge becoming long and loose to form a mossy fringe to the border.

[Fig. 158.]

Post Oak—(*Quercus obtusiloba*, Michx.)

The Post Oak is usually a much smaller tree than either of the preceding. It is not very common in the Northern States, but becomes abundant at the South. In Southern Illinois are large tracts of low, flat land, principally covered with this species, and hence called post oak flats. Its wood is very compact and durable, and is highly valued for making fence posts. The leaves present considerable variation, being generally obovate in outline with fewer and larger lobes than in either of the preceding species. The upper part of the leaf usually presents three large rounded lobes, below is a triangular portion running to a point at the base. They are thick and leathery when mature, and of a yellowish-gray color on the under side. The acorns are smaller than those of the White Oak, one-half to two-thirds of an inch long, and about half covered by the saucer-shaped smooth cup.

As THE influence of flowers is always refining and ennobling, so the associations they bring are always the purest and sweetest. Who can imagine a person giving flowers to any but a friend? And did you ever know of a very bad person who loved and cultivated flowers?—*Mrs. T. A. E. Holcomb.*

THE HOP-TREE OR WAFER-ASH.

(*Ptelea trifoliata, L.*)

BY DR. E. M. HALE, CHICAGO.

(Fig. 159.)

Hop-tree or Wafer Ash (*Ptelea trifoliata*, L.)

The Hop-tree (*Ptelea trifoliata*, L.) is a shrub or small tree of the natural order *Rutaceæ*, to which belongs also the Rue of the gardens, the Prickly-ash (*Zanthoxylum Americanum*, Mill) and the Southern Prickly-ash (*Z. Carolinianum*, Lam.) In some respects these last-named are medicinal as well as botanical analogues of the Hop-tree. The genus *Ptelea* has polygamous flowers, *i. e.*, the perfect and imperfect flowers are variously mixed. They have four or five stamens, and a thin, wing-like fruit, which is two-celled, but one cell only perfects seed. Its name, *Ptelea*, is the Greek for *Elm*, given because of the resemblance of the wing-like or *samaroid* fruit. Its six known species are all North American. Three are Mexican. One Southern species (*P. mollis*) is clothed with a silky pubescence. Another species, *Ptelea Baldwinii*, of East Florida, has minute leaves with obtuse leaflets. The remaining species, the subject of our sketch, known in Britain as Shrubby Trefoil, is indigenous throughout the United States, from the East to beyond the Mississippi, and even to Texas, in moist shady places, and on the borders of woods and among rocks. It is a tall shrub, but under cultivation at Gordon Castle, Scotland, it had, in 1835, reached the height of forty-five feet, with a trunk fifteen inches in diameter, and with branches extending twenty-seven feet from side to side. Two varieties have been found—one with five leaflets (*P. Pentaphylla*, Mœnch), the other with the branches, petioles and under surface of the leaves clothed with a soft tomentose pubescence, even when old (*P. pubescens*, Ph.) It was originally sent to England by Bannister, but being lost was reïntroduced by Catesby in 1724 from Carolina. It is common in the gardens of Europe; and in the Jardin des Plants, at Paris, a tree may be seen the crown of which had in sixty years from planting attained a diameter of forty-five feet.

The first mention of the Ptelea in the medical literature of this country is found in Rafinesque's Medical Botany. He observes that "the leaves are vulnerary, used for poultices. and an anthelmintic." It is mentioned in Griffith's Medical Botany: "The native species, *Ptelea trifoliata*, is said to be anthelmintic, for which purpose the leaves and young shoots are used in strong infusion. The fruit is aromatic and bitter, and is stated to be a good substitute for hops." In Howard's Botanic Medicine, 1836, it is described under the vulgar names of Cure-all, Ague-bark, Pickaway, Anise, and Wing-seed. It is in more or less repute by all the different medical schools for various medicinal virtues. It certainly is deserving of greater notice for cultivation than it receives in this country.

ZANTHOXYLUM CLAVA-HERCULIS.

During the summer of '64, while a resident of the central part of the State of New York, my attention was called to a tree growing about fifteen miles south of Syracuse and two miles south of the place of the Cardiff Giant notoriety. The gentleman who pointed the tree out to me said he thought there was a tree I could not find a name for. The tree was standing in an open field, and looked stately and majestic at a distance, having a symmetrical top, the trunk being, I should judge, about eighteen inches in diameter, and free from limbs till it reached the height of twenty feet. The leaves were decompound, something like the Honey-locust, though much larger, many of them measuring over two feet in length, one I measured being twenty-seven inches. The tree owed much of its beauty to the multitude of leaflets that made up a single leaf, as the branches, when stripped of their foliage, had a rough club-shape, about as beautiful as some of our Sumacs under similar circumstances. I could not find any name in my botany, either scientific or common, that I was willing to call it, and all the name I could find by inquiry among the inhabitants, was "The Tree." People who had lived there more than forty years knew as little as I did about it; only that the tree had stood there from their earliest recollection, and had changed but little during that time. Being different from the rest of the forest trees, it had been left when the land was cleared, probably as a curiosity. I found upon inquiry that there was an old surgeon living at Pompey—a small place ten miles northeast—who could tell me about this wonderful tree. I wrote to him, and in reply he gave me not only the name of the tree but some other facts concerning it; however, I will give his description, using such parts of his letter as applies to this subject:

"The tree you speak of on Mr. Winchel's farm I recollect, as it was a rare specimen which I did not expect this side of Mason and Dixon's line. This tree is the *Zanthoxylum clava-Herculis*, and it is a native of the West Indies, and not of the United States; it is also found on the coast of the Chesapeake Bay. The *Zanthoxylum fraxineum* is indigenous to the Northern and Middle States, and was considered by Linnæus as a variety of this species. About forty years ago there was a tree of the same kind growing in this town (Pompey), which attracted much attention, and was visited by DeWitt Clinton, former Governor of this State. He pronounced it the *Zanthoxylum*, and said he knew of no other tree of the kind this side of Louisiana. The original tree was cut down, but a few sprouts have been preserved, and are considered beautiful shade trees. A medicine has been extracted from the bark called *Zanthoxylin*, which is found useful in rheumatism, and in quickening the blood. It imparts its virtues to water by boiling, or to spirits. This tree is so rare I think it would be profitable to cultivate all you can. JEHIEL STEARNS."

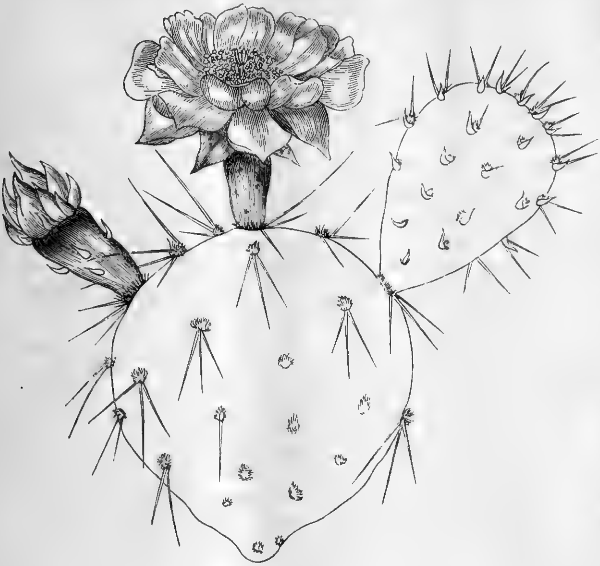
I wrote to Prof. Wood upon the subject a short time afterward, but he seemed to be ignorant of any such tree, nor have I seen this species referred to by Gray. The only reason I could assign for its being so far north was that it had been brought there by the Indians in some of their migrations from the shores of the Chesapeake, perhaps, and planted there for its medicinal properties. In substantiation of this view, there are abundant evidences that the ground where both these trees stand was used long before the plow of the whiteman touched its soil for an Indian camping ground, as Indian relics are found there in such abundance as to indicate that it was not the transitory lodge for a day or two, but an often frequented resort, if not a steady dwelling place. Again, the tree I observed, though not very large, is old. I counted the concentric rings of a limb less than an inch in diameter, and found that there were twenty-six yearly additions; another, a little more than an inch through, had over forty: so that if the body of the tree grew as slowly as the limbs, a hundred years would make but very little change in its size. I find, then, in a specimen I have before me, there are eighteen wood circles in five-sixteenths of an inch. That climate does not seem to be natural for it, as I noticed the next spring that it did not leaf out till long after the other trees had spread their leaves to the sunshine. It seems to be somewhat acclimated, however, for though late in putting forth its leaves, and also not maturing its young shoots always so but that they die near down to the beginning of that year's growth, yet it thrives and braves the winter winds and snows, slowly assimilating earth and air to its use during the more genial part of midsummer, when the climate is nearer that of its native West Indies. Though it grows so slowly there, I am satisfied from its appearance that it would be a tree of rapid growth where the climate is more favorable. G. H. FRENCH.

IRVINGTON, ILLS.

[NOTE.—We invite attention to the subject of the above article. *Zanthoxylum fraxineum*, referred to in Dr. Stearn's letter, is a synonym for our American Prickly Ash (*Zanthoxylum Americanum*, Mill), which was also called by Linnæus a variety of *Zanthoxylum Clava-Herculis*. The Angelica tree (*Aralia spinosa*, L.), which grows in the Southern States (reaching also into Southern Illinois), is sometimes called Prickly Ash, and is found in cultivation under the name of Hercules' Club. If dried specimens of the leaves of the tree in question could be sent to a well informed botanist, we do not doubt the species could soon be determined.—ED.]

A WORD or two, supposing we have flowers: In the genial spring time, after the close confinement of winter, outdoor work is happiness. To hoe, to rake, to dig in the moist fragrant earth, seems to be what we shall always like to be doing. But it is not always spring. Plants are the most tyrannical of pets; they must be tended in season and out of season. Neglect is death; or worse, deterioration. Better have only a grass plat, than a garden gone to waste. It makes one think of the garden of Eden after the fall.

[Fig. 160.]



The Prickly Pear—One-half natural size.

THE PRICKLY-PEAR FAMILY.

Rafinesque's opuntia (*O. rafinesquii.*)

[From the Journal of Agriculture.]

This family comprises a number ot genera of different habits and appearance. They are mostly natives of sandy, arid soils, and are of a fleshy, succulent nature, destitute of ordinary leaves, having a skin or epidermis of such a nature that they part very reluctantly with any of their juices by exhalation, and hence are peculiarly fitted for growth upon our great Western plains, and especially on the more southern, almost rainless districts of Arizona and New Mexico.

In the eastern part of our country we have only one genus, *Opuntia*, and but very few species. The common Prickly Pear of the Eastern States is *Opuntia vulgaris*, Mill. In some of the Western States, we have also Rafinesque's Opuntia (*Opuntia Rafinesquii*, Engel.), and *Opuntia Missouriensis*, D. C. As we proceed westward and southward we find many new species, and several new genera. All travelers over the great Plains will remember the profusion of these plants in that region—so plentiful, indeed, as to seem to form the principal vegetation. Many, too, will remember the grand and beautiful display sometimes seen, of miles in extent, covered with their large and handsome yellow and red blossoms.

Dr. Engelmann, of St. Louis, has carefully studied our Cacti. and classified them in the following genera: 1, *Mammilaria*; 2, *Echinocactus*; 3, *Cereus*; and 4, *Opuntia*. The last named genus is most numerous, and comprises within our limits over twenty-five species.

It is divided into two sections, viz: the broad or flattened kinds, and those of a cylindrical form. Some of these, in Arizona and New Mexico, are woody and arborescent, giving a very peculiar appearance to those regions.

The fruit of many species is pulpy and edible, and in some regions is an important article of sustenance for the Indians who inhabit the country. The seed and pulp of others furnish food for many small animals, and in the Rocky Mountains a species of rat, which makes its abode in the rocks, collects large piles of Prickly-pear and the spiny branches of Grease-wood, to barricade the entrance to its nest.

Our engraving gives a view of the *Opuntia Rafinesquii*, Engel., one of the handsomest of the genus. This is now introduced into cultivation by some of our florists, among others, by Michel Bros., St. Louis.

THE love of flowers is such an acknowledged virtue that many claim it who do not possess it. It seems to me that a lady who only hires a stranger to cultivate and cut her flowers, and has no other use for them than the adornment of her house or her person, evinces more admiration for herself than for her flowers; and I cannot help questioning the genuineness of that affection, which permits the last novel to make one forget to water plants, or the delicacy of one's hands prevent cultivating them.—*Mrs. T. A. E. Holcomb.*

THE ROSE.

The Rose is preëminently the flower of the millions. History, romance and poetry would not be complete without the rose. Many flowers are more distinguished for particular features of interest, but none possess so many elements of attraction and interest as the rose. Beauty and fragrance are here conspicuously wedded together. Not only has Nature made the rose the type of one of the largest Orders of the Vegetable Kingdom; but, in some form, she has diffused it over almost every portion of the globe. Over two hundred distinct species are enumerated by botanists, and the varieties that have been produced by cultivation and horticultural skill are almost numberless.

Although the rose is in all nations a public favorite, it is not so because it has ever been made to serve the primary wants of man for food or clothing. But as an agent in the elegancies and refinements of life, where has it an equal? Attar of roses, conserve of roses, vinegar of roses, honey of roses, and rose water, are various preparations known to commerce as so many embodiments of the delicious perfume of this universal favorite.

The North American species of this genus are few, perhaps not exceeding a dozen, and not more than half of these east of the Mississippi river. The Prairie Rose (*Rosa setigera*, Michx.), which grows wild in nearly all the Western and Southern States, is a vigorous grower and prolific bloomer, and by cultivation has given rise to several double-flowered and highly prized varieties. It is our only representative of the section with united and protruding styles. The Swamp Rose (*Rosa carolina*, L.) is a large shrub growing in swampy ground, or on low, wet margins of streams. It produces an abundance of large and showy flowers. Two other common indigenous species of wild rose, the *Rosa blanda*, Ait., and *Rosa lucida*, Erhr., are small shrubs of similar habit, and in some of their forms approach so near each other as to make it doubtful if they should not be reduced to a single species.

But the wild, or natural, state of the rose is not that condition which is most commonly admired. The *double* condition of the rose is what gives it value with the horticulturist, although, in the eye of the botanist, that is regarded as an abnormal condition. If we examine a wild rose, we shall see that it has but five petals, while its stamens are very numerous, often fifty or more. These stamens arise from the same part of the flower as the petals, *i. e.*, from the calyx. Now, if we examine a double rose, we shall find that its petals have multiplied wonderfully, while the number of stamens has been greatly reduced, indeed in some instances there are hardly any discernible. How, then, has this change been effected? In answering this question we must refer to the fact that all the parts of a flower are but modifications of the leaves. The beautiful petals are but delicate colored leaves, and the stamens are but contracted leaves, altered to adapt them to a particular purpose. If we compare a fully expanded petal with a stamen, we notice a great difference, both in shape and size, but by examining a double rose we shall find some stamens just a little enlarged, others a little more expanded, so as to present some resemblance to a leaf or petal, and so on through all the stages of transition to perfect petals. Hence we find that, under the stimulus of cultivation, the stamens take on the leafy development, instead of contracting to their normal form. Occasionally we find roses which unfold to us still more clearly the structure of the floral organs, by a reversion of the pistils to the leafy state, so that the appearance is presented of one rose growing up through another.

The subject of vegetable transformations is one possessing intense interest, and one which we shall have occasion to refer to again.

DEFINITE AND INDEFINITE VEGETABLE DEVELOPMENT.

Plants inhabiting temperate and northern latitudes in which the seasons do not admit of indefinite growth, complete their growth and mature their seeds in longer or shorter periods of time as their situation in respect to length of period of growth may require. This is especially true of those species that perform their functions in a single process, as Maize in cultivated plants, and the Oaks of the indigenous. This definite or indefinite character of species in development and growth enables the cultivator to determine approximately the latitudes of their natural habitats, and to give them that special treatment they require to obtain the best results. Species with a definite growth, as Maize, suffer from loss of time by neglect of the cultivator, or by the unfavorable conditions of season or situation, but species of *indefinite* growth, as Cotton, the Castor-bean, and plants of the Squash family (*Cucurbitacæ*), can be subjected to loss of time with comparatively little detriment, except from loss for want of time at the end of the season. Cultivators having these facts in view can more satisfactorily determine the several treatments required for each species. Premature planting of the definite class, or the neglect of suitable conditions, or of proper early cultivation, or any treatment that gives them age without corresponding growth, invariably diminishes the product. The definite class of tropical species requiring a high temperature for their development soon acquire the habit of suiting themselves to their new conditions, and complete their vegetative processes throughout in a much shorter time than when in their natural habitats, as if not to be defeated, by those unfavorable conditions, of the object of their existence, viz., the production of seed—the functions of growth are suspended in due time to allow for this to be accomplished, while the indefinite class go through the whole season maturing and producing vegetable growth as well as seed, and as the best results with this class are obtained by the longest time, the earliest planting is most successful—age with this class is in nowise detrimental, rather profitable. The Squash family (*Cucurbitaceæ*), Potato family (*Solanaceæ*), Mallow family (*Malvaceæ*), the Pea family, in part, and many other orders to some extent belong to this indefinite class. All the cereals, the *Compositæ*, and also the great majority of other orders belong to the definite class. E. HALL.

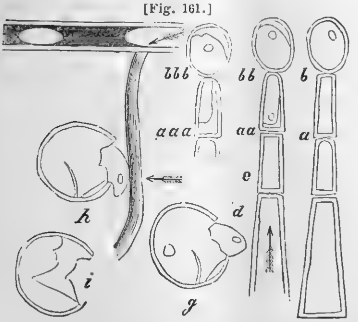
VEGETABLE CELLS.

BY DR. FELIX SCHAAN, CHICAGO.

PART II.

The second part of the vegetable cell is the nitrogenous or primitive utricle (*utriculus primordialis*). It is a half solid delicate membrane of nitrogenous matter lining closely the interior of the cellulose membrane.

[Fig. 161.]



In all cells mentioned above I was unable to discover the existence of this membrane, and some days ago I wrote a note tending to demonstrate that this membrane does not exist in fact. But being careful I discovered it in the hair which grows on the stem of Geranium. This hair has the shape of a pharos or lighthouse. It is composed of four cells, the inferior in connection with the epithilial cells is conical, having a large base, and diminishing until the half of the length of the hair where it is attached to the two other quadratic cells, also both conical in shape. On the top of the third we find a larger spherical body which presents also the side wall of the cellulose membrane (Fig. 161, a^1) and lay shrunken on one side. During this time the *cytoblast* was distinctly to be seen.

I was not satisfied with that result because I could not distinguish the membrane isolated, and the retiring of the contents could be explained as a folding of any nitrogenous substance without any genuine *coat*. That doubt left me considering the following experiment with the spherical head-cell of the hair.

The successive action of the sulphuric ether upon it gave place to a hole in the cellulose membrane, which here also grew successively larger by the retiring of the contents. (Fig. 161, b^1 b^2). I remarked in this case also the cytoblast more distinctly. I also observed a double contour on the retiring membrane, but the conviction that it was really a membrane was enforced by the partial isolation of the *utriculus primordialis*, which I performed by a rubbing pressure of the covering-glass. The design presented itself as a leak or crevice (Fig. 161, *g*) in the cellular membrane, permitting the primitive *utricle* to escape in part, prolapse-like, showing its cytoblast clearly. Was that a membrane?

The ether evaporated rapidly and formed a concave meniscus between the two glass-plates, like every fluid wetting the glass. The power of this retiring meniscus can be calculated by stated physical laws, into which I will not here enter. I will only state that this power of the retiring concave meniscus of the evaporating ether was strong enough to bend the prolapsed primitive utricle over the inferior edge of the leak in the cellular membrane. (Fig. 161, *h*). By adding a drop of ether, the elasticity of the membrane equalized the bending again, and the prolapse took its prior shape. Was it a membrane?

Acetic acid reabsorbed most of the contents. (Fig. 161, *i*). This part of my study was troubled by losing the object out of sight a moment, and when I found it again, the primitive utricle had shrunken at the inside corner of the cellulose membrane. The prolapse was gone, and the edges of the leak could be observed very fairly. *It was a membrane,* and this membrane was composed of nitrogenous substances, corroded by acetic acid!

PART III.

The third part to consider is the contents of the vegetable cell. This content conducts us into a labyrinth, because every thing we win out of the plants can be searched in the contents of the cell. Proceeding with order we may find Ariadne's thread.

We may divide the contents into starch, fat, crystals, chlorophyll, granular substances, gases; or we may have nothing but the cytoblast or nucleus.

1. Starch is so well known that I need not remind that it is colored by an aqueous solution of iodine, deeply blue, that it often has an amorphous form, as in the root of Valerian, or a form of granules, or that of roundish bodies (as in the Potato) in most of the grains, and that of compound granules in Sarsaparilla. (Fig. 141.)

2. Fat is found in many cells. It looks under the microscope like a white or colored round spot. The microscope alone gives not the conviction of the fatty constitution of these globules. It is by dissolving the fat in ether that we see it disappear, and after the evaporation of the ether we see the fat spots disseminated around the object-glass, often very distant from its primitive situation in the cell: a good object for this observation is the rind of an orange (*Citrus Aurantium,* L.) A fine slice displays large cells filled with yellow round spots. Before adding the ether, I added acetic acid to resolve the nitrogenous matters which might surround the fat-drops. The ether is known to coagulate these matters, and so its access to the fat might be obstructed. By the addition of ether the fat-drops disappear quickly under the development of gas, whose globules show a rapid movement in any direction.

THE Natural Order *Leguminosæ* furnishes many of the most valuable vegetable products: peas, beans and lentils for food; the Tonka bean and sweet clover for fragrance; the Brazil wood logwood and indigo for coloring matter; the rosewood, locust, and other trees for valuable timber; and a long list of medicinal substances, as liquorice, tamarinds, gum-kino, gum-catechu, gum-Arabic, gum-tragacanth, balsam of Peru, balsam of Tolu, senna, &c.

ANSWERS TO CORRESPONDENTS.

Poisonous Plants.—We notice with pleasure that Botany has been wedded to Entomology in your publication, and beg your attention to the enclosed plants, which were received from the western borders of our State, with statement that a family had used them as greens, and almost immediately sickened with symptoms of poison, two of them having died already.

GEO. T. ANTHONY.

LEAVENWORTH, KANS.

The specimens as they reached us were so wilted and dried up as to be in a bad state for recognition. They represented two herbaceous plants—one of them consisting of young and small specimens of *Troximon cuspidatum*, Pursh, a plant of the Natural Order *Compositæ*, having relationship in botanical characters to the Dandelion, and sometimes called the Prairie Dandelion. It occurs sparingly in Northern Illinois, becoming more common in Iowa and westward. It has a long thick root with a milky juice, much like that of the Dandelion. We can hardly suppose that this plant is poisonous. We do not know that any American plants of this family are strictly poisonous, though some of them are acrid, and would be too disagreeable to be eaten in any quantity. The other plant we are not yet able to determine. It has the appearance of some species of Artemesia, but there is not sufficient material for identification. It has just started its growth, and consists of a small tuft, about three inches high, of rather wedge-shaped leaves, gashed near the top, and whitish wooly below. Let it be watched until it comes into flower, then it can be determined. If these are the plants which caused the poisoning, the public welfare requires that they should be known so as to be avoided.

Plants to Name—*Mr. S. A. Forbes, Benton Ills.*—The plants you send are from one of the most interesting botanical regions of this country, *i. e.*, Southern Illinois. A large number of plants are found there whose native home seems to be much farther South. These are mostly well dried and easily determined. No. 1 is the large flowered Synandra (*Synandra grandiflora*, Nutt), a handsome plant of the Mint family. No. 2 is the Lyre-leaved Sage (*Salvia lyrata*, L.), also a member of the Mint family. No. 3 is a Wild Cat-briar (*Smilax tamnoides*, L.) No. 4 is a species of Ground Phlox (*Phlox bifida*, Beck.) No. 5 is *Obolaria Virginica*, L., without a *common* name, a small and delicate flower of the Gentian family. No. 6, is one of the Winter-berries (*Ilex decidua*, Walt.), belonging to the same genus as the Holly. It is a shrub growing six or eight feet high, and in places where it is abundant the appearance of the bushes in the winter is very beautiful from the abundance of the bright red berries. No. 7 is the low Blue-berry (*Vaccinium vacillans*, Sol.) No. 8 is the Farkle-berry of the South (*Vaccinium arboreum*, Marshall), which is an evergreen bush growing on rocky hill sides. No. 9 is the Small-flowered Valerian (*Valeriana pauciflora*, Michx.) No. 10 is the Narrow-leaved Fever-wort (*Triosteum angustifolium*, L.) considerably smaller than the common species, *T. perfoliatum*, L. No. 11 is the Buffalo-clover (*Trifolium reflexum*, L.) No. 12 is the Butterfly Pea (*Clitoria Mariana*, L.), a handsome large-flowered plant of the Pea family, worthy of cultivation. No. 13 is the Water-locust (*Gleditschia monosperma*, Walt.) No. 14 is the Cucumber-tree (*Magnolia acuminata*, L.), a large and beautiful tree, which is hardy much farther north, and ought to be cultivated for shade and ornament.

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Entomological Department.

CHARLES V. RILEY, EDITOR,
221 N. Main st., St. Louis, Mo.

THE WHITE-LINED MORNING SPHINX.

(*Deilephila lineata*, Fabr.)

[Fig. 162.]

Colors—White, olive and rose.

The very great diversity of form and habits to be found amongst the larvæ of our butterflies and moths, has much to do with the interest which attaches to the study of these masked forms. We are moved to admiration and wonder as thoroughly to-day as in early boyhood, every time we contemplate that within each of these varied and fantastic caterpillars—these creeping and groveling "worms"—is locked up the future butterfly, or moth, which is destined, fairy-like, to flit through the air on its gauzy wings, so totally unlike its former self. Verily the metamorphoses of the lower animals must prove a never-failing source of joy and felicity to those who have learned to open the pages of the great Book of Nature!

But, beyond the general satisfaction experienced in studying these transient forms, there will be found ample food for the philosophic mind in the larval variations to be met with in the same species. In other parts of this present number we have instanced several curious variations in larvæ, caused by the character of their food-plant, and have also shown how some species (*e. g.* the common Yellow Bear) vary very much without regard to food-plant. Our Sphinx larvæ, more particularly, are subject to these variations, and it is for this reason that larval characters alone, unaccompanied by those of the perfect insect, are of so little value in classification.

The White-lined Morning Sphinx (Fig. 162) presents one of the most striking cases of larval variation, as may be seen by comparing the dark form of Figure 164 with the light form of Figure 163. In the summer of 1863 we took both these forms on the same plant, and have repeatedly met with them since; but the moths bred from them show no differences whatever.

This beautiful moth is called by Harris the White-lined Morning Sphinx, though its generic name means "Evening Friend." It is distinguished principally by its roseate under-wings, and by a broad, pale band running from the apex to the base of the dark-olive front wings.

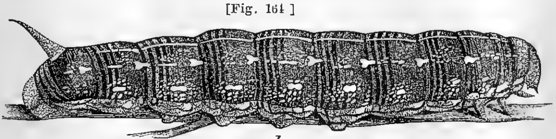
[Fig. 163.]

Colors—Green, crimson, orange and yellow.

It is a tolerably common insect, and may quite frequently be seen at twilight, and even during the day, hovering, humming-bird-fashion, over verbenas and other flowers. The larva feeds upon purslane, turnip, buckwheat, watermelon, 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 form of this larva is that given at Figure 163; its color is yellowish-green, with a prominent subdorsal row of elliptical spots, each spot consisting of two curved black lines, enclosing superiorly a bright crimson space, and inferiorly a pale yellow line—the whole row of spots connected by a pale yellow stripe, edged above with black. In some specimens these eye-like spots are disconnected, and the space between the black crescents is of a uniform cream-yellow. The breathing-holes are either surrounded with black, or with black edged with yellow. The other form is black, and character-

[Fig. 164.]



b

Colors—Black, orange and yellow.

ized chiefly by a yellow line along the back, and a series of pale yellow spots and darker yellow dots, as represented in our illustration (Fig. 164). Even this dark form is subject to great variation, some specimens entirely lacking the line along the back, and having the spots of different shape.

This insect has a wide range, as it occurs in the West Indies, Mexico and Canada, as well as throughout the United States. Feeding as it does principally on plants of but little value, and being very commonly attacked by the larva of a Tachina-fly, this insect has never become sufficiently common to be classed as injurious.

DESCRIPTIVE ENTOMOLOGY.

In a paper on the larval history of certain moths, from the pen of that earnest entomologist, J. A. Lintner, of Albany, N. Y., the following passage occurs:

> Every faithful student will welcome each contribution, however trivial, which shall hasten the day when of each insect the egg, the larva, the pupa, and the imago, or perfect form, shall all be known, described and figured, and the discovery of a new species, however microscopically minute it may be, shall be a triumph.*

*Proc. Ent Soc. Phil., III, p. 645.

This is a noble burst of entomological enthusiasm; but let us pause here for a moment and make a few calculations as to the probability of a consummation so devoutly to be wished ever being achieved. It is usually estimated that in the whole extent of this terrestrial globe, there exist about half a million distinct species of insects. We strongly incline to believe that, even if we double this number, we shall still be rather under than above the correct estimate. Nevertheless, to be on the safe side—for we always dislike to overstate a case—we will consider the customary estimate as a tolerably near approximation to the truth. Let us suppose now that Mr. Lintner's idea is about to be carried into practical effect, and let us ask ourselves the following three questions:

1st. How much space upon our bookshelves will a work occupy, which describes and figures every insect in the world in each of its four stages?

2nd. How much time will it take to write such a work, and how much to execute the requisite drawings?

3rd. What will be the cost, in dollars and cents, of printing, say 10,000 copies of such a work, and of executing the requisite colored drawings and colored engravings to illustrate half a million insects in their four distinct stages?

Suppose we consider these three questions in the order in which they stand, numbering the answer to each, so as to correspond with the question itself.

1st. It will be allowed by every one, who has had much experience in such matters, that the four stages of an average insect cannot be accurately and satisfactorily described in less than one octavo page of ordinary brevier or bourgeois type. We should be inclined to double this estimate, but we are determined not to overstate the case. The illustrations of an insect in its four stages—considering that there are many insects so large in the perfect or winged state as to cover the whole surface of an octavo page, and considering further, that even such as are exceedingly small must be considerably magnified by the artist, in order that the drawing may be worth anything at all—will certainly occupy one-fourth of an octavo page. Thus, as an average insect will occupy 1¼ octavo pages, it results that, to describe and illustrate 500 insects will require 625 octavo pages, which is about the number of pages contained in one stout octavo volume. Moreover, it further follows, that to describe and illustrate 500,000 insects will, of course, require just 1,000 times the space required for 500, or 1,000 octavo volumes of 625 pages each. Now, with paper of ordinary thickness—weighing, say 50 pounds to the ream—such a volume when bound occupies just two inches of space on a book-shelf. Consequently, to hold 1,000 such volumes would require a length of shelving slightly exceeding 160 feet; or supposing the shelves to be 1 inch thick and allowing 11 inches space between each pair of shelves, the whole 1,000 volumes would just fill seven book-cases each 6 feet high and 4 feet wide. Truly, this would be a snug little entomological work, altogether ahead of the Japanese novel which was commenced forty years ago, and after being continued yearly at the rate of three volumes per annum, has at length, in the year 1870, been brought to a prosperous conclusion by the simultaneous death of the hero, the heroine, and the author!

2nd. Our own experience is that we cannot *properly* determine and describe any insect, in the winged state alone, at a more rapid rate than three species per diem. We know very well that many of the published descriptions extant have been thrown off by authors—*currente calamo*—in half an hour or an hour; and we may find, in the Proceedings of one of our Natural History Societies located not 5,000 miles from the very "Hub of the Universe," descriptions that have been quite recently published, and from which not one person in five hundred will recognize the insect described. What are such descriptions worth? Nothing at all! They are often written with entire neglect of the preparatory states, variations, or habits of the insect, and instead of laboriously examining several dozen specimens of either sex, and noting down carefully in the description every considerable variation that occurs in any one specimen of either sex, such authors often describe from isolated specimens without mentioning the fact. In this way our synonomy is multiplied, and the author's work is often lost to the world, as it well deserves to be, unless he is fortunate enough to leave behind him ticketed specimens of those insects he has himself described, so that subsequent inquirers can recognize the insect intended, and give the world assurance of its identity. Instead of giving us the differences, whether structural or colorational, that on the most diligent search can be found to occur in a certain number of individuals, whether of the male or female sex, that belong to the species, some authors in describing, are in the habit of coolly throwing aside all but one which they pick out and are pleased to call the "typical" specimen; so that such a description merely gives the *individual* and not the *species*. And yet such bastard scribblings are every day foisted upon the scientific world—not by the neophite, in whom such a course might be pardonable, but by some entomologists of experience—and in the estimation of many a young student, he that can publish the greatest quantity of such trash per annum, is the greatest entomologist of the day! Verily, posterity will be of a different opinion as to this matter; for, unless we are greatly mistaken, such descriptions will be confined to the same dusty immortality in which quietly repose, undisturbed by the curious fingers of all genuine naturalists, the learned lucubrations of Rafinesque, and of other authors of that stripe.

But let us return from this digression, which was somewhat necessary to prevent our being accused of overstating the case, and to relieve the tedium caused by so much dry calculation. We will assume, to be on the safe side, that it requires not the third part, but only the fourth part of a day, accurately to describe an average insect in its perfect or winged stage. We will make no extra allowance for the time expended in tracing the species through all its four stages, and making sure of the fact that we are not describing the egg of the bug A, the larva of the bug B, the pupa of the bug C, and the winged form of the bug D, as all belonging to the same species, which may be either A, B, C or D. Surely, therefore, when we consider that to thoroughly investigate the history and figure the four stages of many beetles requires from one to six years, and of certain Cicadas from thirteen to seventeen years, we shall not be accused of exaggeration when we assert that it requires at least one entire day's hard work to describe any particular insect in all its four stages. On the contrary, those who have had most experience, will best understand how very low this estimate must be. Now there are 500,000 species to be thus described. Consequently, upon the above assumption, it will require 500,000 days to execute the work. Suppose we allow 300 days as the working year of a naturalist, which, though fewer than he may sometimes have to work, is surely driving him hard enough in all conscience. Then it follows that, for the manuscript alone of our little Cabinet Encyclopædia of Entomology, there will be required the labor of 1,666 years. Now let us talk about the illustrations that will be required. We have considerable personal experience in this matter, and we assert unhesitatingly that few artists can execute good colored drawings of an average insect in its four stages in anything like a day's time. Indeed, in most cases, it takes much longer to make a good figure than to write out a good description, and, in our estimation, the person who makes a good and diagnostic figure of any of the transient preparatory states of an insect, is entitled to fully as much credit as the one who writes out the description; and we have always felt inclined to give Westwood as much credit for his excellent out-line block-illustrations, as for the still more excellent text in his *Introduction.* But let us put the time required for this purpose at one day, which makes the time devoted to the drawings exactly equal to the time devoted to the manuscript of our proposed Pocket Edition of the little World of Insects. Then it follows, on the assumption that we have to add another 1,666 years to the 1,666 years already taken into account; which makes the sum total 3,332 years. Now, it is notorious that naturalists—being as a rule usually moral and regular in their habits—live to a good old age, and we will make for them the liberal estimate of an average life of 80 years; but on the other hand, artists are generally loose in their mode of life, and we cannot, with the statistics before us, grant them a longer average term than 50 years. Consequently, the average life of the two classes of persons required, in equal numbers, for our Cabinet Encyclopœdia will be only 65 years; and allowing 25 years for the education of each individual naturalist and artist, there will remain a clear available average surplus of 40 years as the average working life of each class. Let us now divide the sum total of 3,332 years by 40, which represents in years the working life of each of our workmen, and we arrive at the astounding conclusion that it will require the entire working life of 83 persons to execute the manuscript and the drawings for the little work which the eye of Mr. Lintner has pictured to himself as likely to exist, perhaps before he himself sinks into the grave!

3rd. The cost of printing, in the style of the AMERICAN ENTOMOLOGIST, 10,000 copies of an octavo volume of 625 pages, including type-setting, proof-reading, press-work and paper, but charging nothing for any wood-cut illustrations, would foot up about $1,000; and as we wish to be liberal, we will charge nothing for the binding. The cost of the 125 pages of colored illustrations, including the pay of the artists who execute the drawings, would range from $125,000 upwards into the clouds, according to the style of work required. This gives a total of at least $126,000 for each octavo volume; and as there are to be 1,000 such volumes, we shall require for the practical carrying out of Mr. Lintner's poetical conceptions, the snug little sum of very nearly ONE HUNDRED AND TWENTY-SIX MILLION DOLLARS. The statistical reader will no doubt have noticed long before this, that we allow no pecuniary pay whatever to the naturalists who execute the manuscript of our imaginary work. We could not in conscience do so; for we believe there are scores of entomologists anxiously knocking every day at the doors of our Scientific Academies and Associations with manuscripts in hand containing descriptions of their new species; and these MSS. are most distinterestedly offered for publication in the printed Transactions of such societies, their authors never dreaming of receiving the least pecuniary compensation for all the labor and trouble they have been at in preparing their papers for the press.

The question is perpetually put to us, "Why is there no work on the Entomology of the United States, which will enable us to identify and name any particular insect of the country with as much ease as the Botanical student can identify and name any particular one of our plants, by referring to Gray's Manual of Botany?" To such questions as these we beg leave to reply as follows: *In the first place,* it is not true that Gray's Manual covers the flora of the whole Union; for it professedly only comprises that of a region which forms less than one-eighth part of the territory now owned by Uncle Sam. *In the second place,* even in this very limited region, it entirely omits the most difficult and perhaps the most interesting part of the flora, that is the Mosses and Lichens, the Funguses and the Seaweeds (*Algæ*); and even with such other families of the Cryptogamous or Flowerless plants as are treated of therein, namely, the Horsetails, the Ferns, the Club-mosses, and the Water-ferns or *Hydropterides,* the space allotted to these groups is scarcely one-thirtieth part of the space allotted to the Phanerogamous or Flowering plants. For any one, therefore, to consider Gray's Manual—and we fully acknowledge the unrivalled excellence of this work, so far as it goes—as a complete Flora of the whole United States, would be pretty much like claiming that the works of Dr. J. L. LeConte, on the one single Order of Insects out of the whole eight Orders, namely, the Beetles or Coleoptera, are equivalent to a complete Entomological Fauna of all the Insects found in the entire Union. *In the third place,* it is generally estimated that the number of insects exceeds at least four or five-fold that of plants to be found in any particular region. Calculating upon several distinct bases we have estimated that the number of distinct species of insects to be found within the limits of the United States amounts to at least thirty thousand; and from what has been said above, as to the labor and expense of describing and figuring half a million of species, we may easily, by the simple Rule of Three, form a pretty correct idea of how much labor and money it would require to describe and figure even as small a number as thirty thousand.

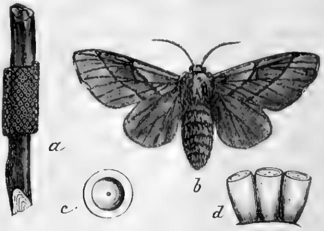
Perhaps, in thus bringing to the test of hard dry facts and figures the rose-colored dreams of one whom we have learned to esteem as a conscientious fellow-laborer, we shall be accused of being a kind of entomological Mr. Gradgrind. Perhaps it will be said that, by throwing cold water on the brilliant aspirations of many an ardent young naturalist, we are in effect injuring the very cause which we profess to serve, and that we are a matter-of-fact cynical calculator, wholly devoted to the dull unpoetical Real, and careless of the beautiful etherial Ideal. Well, "we are not careful overmuch about such things;" but in thus considering the improbability of any such result ever being attained, as that which Mr. Lintner dreamed of, we nevertheless admire the spirit which gave birth to the thought, and only wish that more of our entomologists were imbued with the same. It is good sometimes to seek after the Unattainable, and though we may not always reach the goal, and the distance gained in advance be but a few inches, yet at every step we are so much further on the road towards perfection.

As the very term "species" is arbitrary, and many an one is ground out from what upon closer study and better knowledge would prove to be but a variety, we are fully of the opinion that the man or woman who, for the first time, gives to the world the complete history of any one insect in its four stages, does infinitely more for the cause of Entomology than the person who publishes dry descriptions of a dozen supposed species. In a private letter to us, that well-known and experienced entomologist, P. C. Zeller, of Stetten Prussia, says: "I care very little for the honor of being the author of a new species; it is far more meritorious and honorable to correctly observe and describe the natural history of a single species, than to describe—often with ridiculous and meaningless names—two dozen species after the reckless fashion of some authors;" and we cannot more fully endorse the sentiment expressed by Mr. Lintner—however fanciful and impracticable the project—than by commending to careful consideration this opinion of one of the leading entomologists of the day.

THE TENT-CATERPILLAR OF THE FOREST.

(*Clisiocampa sylvatica*, Harr.)

[Fig. 165.]



Colors—(*a*) brown; (*b* and *c*) cream-color; (*d*) rust-brown.

In accordance with the promise made in our last number (p. 245), we here give a brief account of the Tent-caterpillar of the Forest (*Clisiocampa sylvatica*). We do so the more willingly because, as we shall presently show, this insect is very generally confounded with the common American Tent-caterpillar (*Cl. americana*, Harr.), and because much confusion and uncertainty with regard to its habits exist in the minds of most farmers. In many parts of Missouri it has been very destructive during the past two summers, and we have had good opportunities to closely and carefully study its habits. The species was first described by the great Massachusetts entomologist, Dr. Harris, who unqualifiedly states that it lives in communities *under* a common web or tent; but with this exception gives a very clear and truthful account of it.*

ITS NATURAL HISTORY.

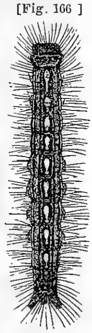
The egg-mass from which the Tent-caterpillar of the Forest hatches (Fig. 165 *a*, showing it after the young larvæ have escaped) may at once be distinguished from that of the common Tent-caterpillar by its being of a uniform diameter, and docked off squarely at each end. It is usually composed of about 400 eggs, the number in five masses which we counted ranging from 380 to 416. Each of the eggs composing this mass is of a cream-white color, 0.04 inch long and 0.025 inch wide, narrow and rounded at the attached end or base, gradually enlarging towards the top, where it becomes slightly smaller (Fig. 165 *d*), and abruptly terminates with a prominent circular rim on the outside, and a sunken spot in the centre (*c*). These eggs are deposited in circles, the female moth stationing herself, for this purpose, in a transverse position across the twig. With abdomen curved she gradually moves as the deposition goes on, and when one circle is

* *Inj. Ins.*, p. 376.

completed, she commences another—and not before. With each egg is secreted a brown varnish which firmly fastens it to the twig and to its neighbor, and which, upon becoming dry, forms a carinated net-work of brown over the pale egg-shell. These eggs are so regularly laid and so closely glued to each other, that the sides are often so appressed, that the moth economizes space almost as effectually as does the Honey-bee in the formation of its hexagonal cells. In confinement the moth very seldom succeeds in forming a perfect ring, but in her abortive attempts, deposits them in different sized patches; and as we have found such unfinished patches attached to an oak leaf out-of-doors, we may conclude that either from injury or debility of some kind, the parent's instinct sometimes fails it even when all the conditions are normal and natural.

The eggs are deposited, in the latitude of St. Louis, during the latter part of June. The embryo develops during the hot summer weather, and the yet unborn larva is fully formed by the time winter comes on. They hatch with the first warm weather in spring—generally from the middle to the last of March—and though the buds of their food-plant may not have opened at the time, and though it may freeze severely afterwards, yet these little creatures are wonderfully hardy, and can fast for three whole weeks, if need be, and withstand any amount of inclement weather. The very moment these little larvæ are born, they commence spinning a web wherever they go. At this time they are black with pale hairs, and are always found either huddled together or traveling in file along the silken paths which they form when in search of food. In about two weeks from the time they commence feeding they go through their first moult, having first grown paler or of a light yellowish-brown, with the extremities rather darker than the middle of the body, with the little warts which give rise to the hairs quite distinct, and a conspicuous dark interrupted line each side of the back. After the first moult, they are characterized principally by two pale yellowish subdorsal lines, which border what was before, the dark line above described. After the second moult, which takes place in about a week from the first, the characteristic pale spots on the back appear, the upper pale line becomes yellow, the lower one white, and the space between them bluish: indeed, the characters of the mature larva are from this period apparent. Very soon they undergo a third moult, after which the colors all become more distinct and fresh, the head and anal plate have a soft bluish velvety appearance, and the hairs seem more dense. After undergoing a fourth moult without material change in appearance, they acquire their full growth in about six weeks from the time of first feeding. At this time they appear as at Figure 166, and for those who are interested in such matters, we quote below* Dr. Fitch's description of the full-grown larva, as it is the first accurate and detailed description that was published, and as we have occasion to refer to it further on.

[Fig. 166]



Colors—Blue, black, white and rufous.

At this stage of its growth the Tent-caterpillar of the Forest may be seen wandering singly over different trees, along roads, on the tops of fences, etc., in search of a suitable place to form its cocoon. It usually contents itself with folding a leaf or drawing several together for this purpose, though it frequently spins up under fence boards and in other sheltered situations. The cocoon is very much like that of the common Tent-caterpillar, being formed of a loose exterior covering of white silk with the hairs of the larva interwoven, and by a more compact oval inner pod that is made stiff by the meshes being filled with a thin yellowish paste from the mouth of the larva, which paste, when dried, gives the cocoon the appearance of being dusted with powdered sulphur. Three days after the cocoon is completed the caterpillar casts its skin for the last time and becomes a chrysalis of a reddish-brown color, slightly dusted with a pale powder, and densely clothed with short pale yellow hairs, which at the blunt and rounded extremity are somewhat larger and darker. In a couple of weeks more,

* The Caterpillar, as seen after it has forsaken its nest and is wandering about, is an inch and a half long and 0.20 thick. It is cylindrical and of a pale blue color, tinged low down on each side with greenish gray, and is everywhere sprinkled over with black points and dots. Along its back is a row of ten or eleven oval or diamond-shaped white spots which are similarly sprinkled with black points and dots, and are placed one on the fore part of each segment. Behind each of these spots, is a much smaller white spot, occupying the middle of each segment. The intervening space is black, which color also forms a border surrounding each of the spots, and on each side is an elevated black dot from which arises usually four long black hairs. The hind part of each segment is occupied by three crinkled and more or less interrupted pale orange-yellow lines, which are edged with black. And on each side is a continuous and somewhat broader stripe of the same yellow color, similarly edged on each of its sides with black. Lower down upon each side is a paler yellow or cream-colored stripe, the edges of which are more jagged and irregular than those of the one above it, and this stripe also is bordered with black, broadly and unevenly on its upper side and very narrowly on its lower side. The back is clothed with numerous fine fox-colored hairs, and low down on each side are numerous coarser whitish ones. On the under side is a large oval black spot on each segment except the anterior ones. The legs and prolegs are black and clothed with short whitish hairs. The head is of a dark bluish color, freckled with numerous black dots and clothed with short blackish and fox-colored hairs. The second segment or neck is edged anteriorly with cream white, which color is more broad upon the sides. The third and fourth segments have each a large black spot on each side. The instant it is immersed in spirits the blue color of this caterpillar vanishes and it becomes black.

or during the forepart of June, the moths commence to issue, and fly about at night. This moth (Fig. 165, *b* ♀) bears a considerable resemblance to that of the Common Tent-caterpillar (Fig. 167, ♀), being of a brownish-yellow or

[Fig. 167.]

Color—Rust-brown.

rusty brown, and having two oblique transverse lines across the front wings. It differs, however, in the color being paler or more yellowish, especially on the thorax; in the space between the oblique lines being usually darker instead of lighter than that on either side; but principally in the oblique lines themselves being dark instead of light, and in a transverse shade, often quite distinct, across the hind wings. As in *Americana,* the male is smaller than the female, with the wings shorter and cut off more squarely. Considerable variation may be found in a given number of moths, but principally in the space between the oblique lines on the front wings being either of the same shade as the rest of the wing, or in its being much darker; but as we have found these variations in different individuals of the same brood, bred either from Oak, Hickory, Apple and Rose, they evidently have nothing to do with the food-plant. The scales on the wings are very loosely attached, and rub off so readily that good specimens of the moth are seldom captured at large. So much for the natural history of our Forest Tent-caterpillar.

THE LARVA SPINS A WEB.

From the very moment it is born till after the fourth or last moult, this caterpillar spins a web and lives more or less in company; but from the fact that this web is always attached close to the branches and trunks of the trees infested, it is often overlooked, and several writers have falsely declared that it does not spin. At each successive moult all the individuals of a batch collect and huddle together upon a common web for two or three days, and during these periods—though more active than most other caterpillars in this so-called sickness—they are quite sluggish. During the last or fourth moult they very frequently come low down on the trunk of the tree, and, as in the case of the gregarious larvæ of the Hand-maid Moth (*Datana ministra*), which often entirely denude our Black Walnuts, they unwittingly court destruction by collecting in such masses within man's reach.

IT FEEDS BOTH ON ORCHARD AND FOREST TREES.

In the summer of 1867 this insect did great damage in Western New York, where it is falsely called THE "Army-worm." From the fact that Mr. Peter Ferris, of Millville, Orleans county, N. Y., was greatly troubled with it that year in his apple orchard, and that he did not notice any of the same worms on the Oak and Walnut timber of that section, he concluded that his Apple-feeding worms must be different from those feeding on forest trees. In an article signed "F., Orleans county, N. Y.", which appeared in the *Country Gentleman* of July 23d, 1868, the same writer endeavors to prove his Apple-feeding worms distinct by sundry minute characters, as may be seen from the following extract:

Now I am not an entomologist, but still must be allowed to believe that there are several points, if not "distinctive characters," in which our caterpillar differs from the Tent-caterpillar of the Forest, as described by Dr. Fitch. His larva is of a pale blue color, tinged lower down on each side with greenish-gray. In ours the prevailing color on the back is black; there is a sky-blue stripe on each side but no greenish-gray. Both have the white spots on the back much alike, though perhaps ours are more club-shaped, looking to the naked eye nearly the shape of ten-pins. Both have these spots surrounded with black; in ours there is quite a broad black stripe on each side of the spots. This black stripe is more or less filled with fine, crinkled, bright orange lines. In some, these orange lines are so plenty as to be seen plainly without the glass; in others the color to the naked eye is a fine velvet-black. In the larva described by Dr. Fitch there is much less of black and of the fine crinkled lines, which are pale orange-yellow. There is a somewhat broader stripe of the same yellow color, in place of a narrow orange one in ours. The lower yellow stripe may be much alike in both, but what is sky-blue in one is greenish-gray in the other. In both, the head is of a dark bluish color, but in his it is freckled with numerous black dots; in ours, both to the naked eye and under a glass, it is plain. In his "the second segment or neck is edged anteriorly with cream-white, which color is more broad on the sides. The third and fourth segments have each a large black spot on each side." Both the cream-white edge and black spots are entirely wanting in our caterpillars.

The habits of the larvæ also appear to be different. According to Harris and Fitch, the Tent-caterpillar of the Forest lives in large societies, under a tent or cob-web-like nest placed against the side of the tree, and comes out to feed on the leaves. Others, as well as myself, have watched our caterpillars and entirely fail to discover that they lived in communities, or in any one place that they went from and returned to. While small, they remain scattered over the smaller branches and on the leaves, and are first seen to begin to get together when about half grown, on some of the higher limbs in the sun. They only collect in large bunches on the trunk and lower limbs; when nearly full grown, and the weather is hot, they get in the shade; and then they never have any web or particular place they return to, or show any uniformity in the size of the bunches. But they only manage in this way while the leaves last. As soon as one tree is stripped they go to another, and when one orchard is used up leave for another. They are great travelers; on a smooth track, like a hard road or a fence cap-board, they get along quite fast. They do not try to keep together, but each one goes on his own hook. There is very little said about the Tent-caterpillar of the Forest traveling in this way.

Then our larvæ appear decidedly to prefer the leaves of the Apple-tree, and only feed on the leaves of other trees when the former are not to be had. Though I am not prepared to say that they will not feed on Oak, Walnut or Hickory trees, under any circumstances, I have repeatedly found these trees in full leaf when not only Apple trees, but Ash and Basswood trees near by, were entirely stripped. The eggs are sometimes laid on Hard Maple shade trees, but the caterpillars leave these trees as soon as they get much size, evidently in search of food more suitable to their taste. This may be the case in regard to Oak and Walnut trees.

They also select different places for their cocoons. Dr. Fitch says the Tent-caterpillar of the Forest selects a sheltered spot for its cocoon, such as the corner or angle formed by the meeting of two or three sides. In this the cocoon is suspended. Our larva selects one or more leaves on any tree that is convenient. The edges of the leaves are drawn together, forming a shelter in which there is generally one cocoon; though when the space is large, and they are very numerous, there are often two or three cocoons together. The cocoon is not suspended, but fastened to the leaf. They spin their cocoons in the forepart of July, and the moths appear in the latter part of the month. The Tent-caterpillar of the Forest spins its cocoon about the 20th of June, and the moth appears in the forepart of July.

Now I think enough has been given to show that two distinct insects are under consideration, but, being only a farmer, I may be mistaken. I would like to see Dr. Fitch's views on this question. Undoubtedly he has read Dr. Walsh's article on "The Three so-called Army-worms," in the Practical Entomologist, and can tell whether our caterpillar is a distinct insect, or only shows the variations that may be expected in the Tent-caterpillar of the Forest.

Now since Dr. Fitch has not, to our knowledge, complied with Mr. Ferris's courteous wish, we shall have to do so ourselves. We have taken upwards of 200 specimens from the same batch of Oak-feeding worms, and upon critically examining them, find that Dr. Fitch's description is accurate, and that the differences or variations mentioned by Mr. Ferris arise in every case, either from a misapprehension of Dr. Fitch's meaning, or from variations which may be found in the same brood. The only real difference between the two writers lies in the statement of Dr. Fitch that the worms live under a large cob-web-like nest, and that of Mr. Ferris that they do no such thing. Both statements should have been qualified, and were made without sufficient observation; for though the normal habit of the worms is to collect outside of their nests, we have seen exceptional instances of their collecting within or underneath it, especially when young.

Now it is just barely possible that, in Western New York there may be a race of these worms that has taken to feeding on Apple and has lost all appetite or become incapacitated for feeding on forest trees; in other words, that there is a phytophagic variety, or a phytophagic species in process of formation. We could mention several similar occurrences among insects,* and to those who believe in the immutability of species these occurrences are incomprehensible enough; but to those who accept the more modern Darwinian views, and believe that species are slowly being formed to-day, just as they have been for long ages and ages in the past, they are most significant, and exactly what we should expect. But that such a race has yet been formed is rendered highly improbable from the following facts: 1st. It is spoken of both by Dr. Fitch and Dr. Harris as occurring on Oak, and by the latter as also occurring on Walnut, Apple and Cherry in the New England States. George E. Brackett, of Belfast, Me.,† in referring to its ravages in the orchard, states that it also ravaged the forests in the summer of 1867, eating the leaves of most kinds of deciduous trees, though Poplar and Ash seemed to be their favorites. 2nd. We have, in this section, successfully transferred them from Oak to Apple, and from Apple to Oak, and now have a suite of moths bred from larvæ which were fed half the time on the one and half the time on the other. Given an equal quantity of Oak, Apple, Plum, Peach, Cherry, Walnut, Hickory, Rose, they have invariably seemed to prefer and thrive best on the Apple.

IS IT EVER VERY DESTRUCTIVE?

This question is raised by Dr. Fitch, who, on insufficient grounds, discredited the previous assertion of Abbot, that it "is sometimes so

* For an account of such insects as are known to have phytophagic varieties or phytophagic species we must refer the reader to Mr. Walsh's papers on the subject in the Proceedings of the Entomological Society of Philadelphia for 1864 and 1865 But, as the most familiar and striking examples we will mention, first—the polyphagous black-pencilled larva of *Halesidota tessellata*, Sm and Abb., found feeding on Oak, Hickory, Elm, Plum and other trees, and the monophagous orange-pencilled larva of *H. Harrisii*, Walsh, found exclusively on Sycamore; the moths from the two being absolutely undistinguishable. Second—the yellow-necked larva of *Datana ministra*, Drury, found on Apple and other trees, and the black-necked larva of the same moth found on Black Walnut and Hickory. Third—the large Butternut and Walnut-feeding form of the common Plum Curculio (*Conotrachelus nenuphar*, Herbst.)

† Amer. Jour. of Hort., Sept., 1867.

plentiful in Virginia as to strip the Oak-trees bare." The destruction it caused in some of the Eastern States in 1866 and 1867 is sufficient to decide this question; but there is every reason to believe that in the South and West its injuries are of still vaster extent. We published last month (p. 245) an account of its injuries at Des Arc, Arkansas, and for the past two years it has been quite destructive both to forest and orchard trees, in many parts of Missouri. In the Oak timber these worms prefer trees of the Black Oak group, and will seldom touch the White Oak in bodies, though when scattered among the other kinds, they attack it also.

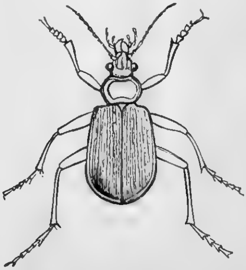
ARTIFICIAL REMEDIES.

From the time they are born till after the third moult these worms will drop and suspend themselves mid-air, if the branch upon which they are feeding be suddenly jarred. Therefore when they have been allowed to multiply in an orchard this habit will suggest various modes of destroying them. Again, as already stated, they can often be slaughtered *en masse* when collected on the trunks during the last moulting period. They will more generally be found on the leeward side of the tree if the wind has been blowing in the same direction for a few days. The cocoons may also be searched for, and many of the moths caught by attracting them towards the light. But preëminently the most effective artificial mode of preventing this insect's injuries is to search for and destroy the egg-masses in the winter time when the trees are leafless. Not only is this course the more efficient because it is more easily pursued, and nips the evil in the bud, but for the reason that, in destroying the eggs only, we in a great measure evade killing, and consequenlly coöperate with, the natural parasites presently to be mentioned, which infest the worms themselves. A pair of pruning shears attached to the end of a pole, and operated by a cord, will be found very useful in clipping off the eggs; or, as recommended by Mr. Ferris, a more simple instrument may be made by fastening a piece of an old scythe to a pole. If the scythe is kept sharp, the twigs may very handily be clipped with this instrument. Tarred bandages, or any of the many remedies used to prevent the female Canker-worm from ascending trees, can only be useful with the Forest Tent-caterpillar when it is intended to temporarily protect an uninfested tree from the straggling worms which may travel from surrounding trees.

NATURAL REMEDIES.

It is always wise to coöperate, whenever we can, with our little friends among the Bugs, and it is consequently very necessary to be acquainted with them. It happens, fortunately, that we have several which aid us in keeping the Tent-caterpillar of the Forest in check, and in the natural forest we must trust entirely to these auxiliaries, as the mechanical means that can profitably be employed in a moderate sized orchard are impracticable in broad extents of timber. Indeed, these cannibals and parasites do their work so effectually that this caterpillar is seldom exceedingly numerous for more than two successive years in one locality. It prevails suddenly in great numbers, and again is scarcely noticed for years, very much as is the case with the true Army-worm. Thus, after attracting such general attention in 1867 in many parts of the East, it has scarcely been noticed since. This is its history everywhere, and we may reasonably hope that in those parts of the West where it has been cutting such a figure the present summer, it will suddenly be so subdued as not to be noticed for some years to come. Its undue increase but combines the assaults of its enemies, until they multiply so as to gain the ascendency. Then, from insufficiency of food these enemies suddenly decrease in numbers, and their natural prey has a chance to increase again. And so it goes on in the "Struggle for Life," and in the great complicated net-work in which every animal organism is involved: a check here and a check there, and no one of all the myriad forms allowed to keep the ascendency beyond a limited time. The most efficient cannibal insects in checking the increase of this Forest Caterpillar, are the larger Ground-beetles belonging to the genus

[Fig. 168.]



Colors—Metallic green, purple and copper.

Colosoma. These beetles will pounce upon the worms with astonishing greed, and are especially prone to attack them when helplessly collected together during the moulting periods. The Rummaging Ground Beetle (*Colosoma scrutator*, Fabr.), which every one will recognize from the figure (168), is especially fond of them. The most common parasite which occurs abundantly in the West, as well as in the East, and which we have bred from several other caterpillars, is a maggot producing a Tachina-fly, which differs only from the Red-tailed Tachina-fly (*Exorista leucaniæ*, Kirk.), which infests the Army-worm, in lacking the red tail.* The other parasite which infests it in the East, but which we have not yet met with, is a species of *Pimpla* very closely allied to *P. melanocephala*, Brullé, but differing from that species in the head being red and not black.†

SUMMARY.

The Tent-caterpillar of the Forest differs from the common Orchard Tent-caterpillar principally in its egg-mass being docked off squarely instead of being rounded at each end; in its larva having a row of spots along the back instead of a continuous narrow line, and in its moth having the color between the oblique lines on the front wings as dark or else darker, instead of lighter than the rest of the wing. It feeds on a variety of both forest and orchard trees; makes a web which from its being usually fastened close to the tree is often overlooked; is often very destructive, and is most easily fought in the egg state.

Exorista leucaniæ, Kirkpatrick=*E. militaris*, Walsh. We have bred the variety lacking the red at tip of abdomen from larvæ of *Attacus cecropia*, Linn., *Datana ministra*, Drury, *Agrotis inermis*, Riley, and of two undetermined Agrotidians.

†*Practical Entomologist*, II, p 114.

A PLAGUE OF BEETLES.—A very serious plague of small brown beetles has occurred in Yorkshire, and during the last few days the Swede-turnip crop has been destroyed. This is especially so in the Wold district, many farms having no plants remaining. At Malton, on Saturday, the farmers obtained new stocks of seed, and re-sowing would commence on Monday. The beetles in myriads have also attacked the tare and pea crops. The long drought is supposed to have favored this destructive visitation of insect life.

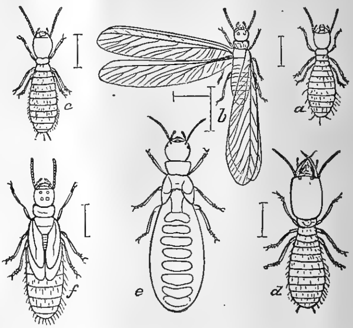
[We find the above in a late number of *Scientific Opinion;* but why talk about such an unusual visitation without even hinting at the species?—ED.]

A correspondent of the *New England Farmer* says that last year he saved his onions from the maggot by removing the earth from the bulbs with his fingers, being careful not to disturb the roots while weeding them. A pound of copperas dissolved in a pailful of soft soap, and, when thinned with water, applied to the onions, is good to keep off the maggot, and to promote the growth of the onions.

HOW TO COLLECT AND STUDY INSECTS—No. 4.

BY F. G. SANBORN, BOSTON, MASS.

[Fig. 169.]



EXPLANATION OF CUT.—(*a*) Larva; (*b*) winged male; (*c*) worker, (*d*) soldier; (*e*) large female; (*f*) nymphe.

There may be something under this old slab, which lies so flat on the surface of the ground; turn it over carefully. Sure enough, besides the earthworms of all sizes and ages that retreat hastily from the garish light of day into their smooth, cylindrical burrows, and the active spider that scampers off in the grass, here are some little whitish insects—a whole colony of a hundred or more—many upon the under surface of the slab, which seems to be channeled and grooved shallowly, exposing the cleaner color of the wood; and many more moving briskly about in corresponding channels on the ground, occasionally disappearing down the holes.

These are the "White Ants," as they are improperly termed, *Termes flavipes* of Kollar. Those stupid and clumsy ones, with immense heads and long black jaws, are called soldiers; touch this one with a spear of grass and see how he rushes to seize it, snapping his jaws and exhibiting every sign of anger and ferocity. There is always a regiment of these soldiers or fighting men attached to every respectable colony of Termites, and their mission is solely to defend their weaker vessels, the workers, against marauders of all kinds. These round-headed ones are the workers, and those tiny, white, helpless fellows are the young. Notice, if you please, how indefatigably the workers are seizing the little ones, one by one, in their mandibles, and carrying them carefully below to some place of security. They pinch up their tender skins on the back, with just sufficient force to get a good hold without harming the tender little creatures, and lifting them up, as a cat carries its kittens, convey them safely away. What are these long, black insects that seem to have something to do with the colony, but are furnished with long, white shining wings? These are the males, they are hurrying down out of sight as quickly as possible; you will never see one of them troubling himself about the care of the young. Nor will you ever see the soldiers doing this good work either; they, cowardly creatures, have retreated into the burrows, and only occasionally the head of one appears at an opening, nearly filling it, and obstructing the way of this nurse-worker, who is obliged to kick and punch the military blockhead repeatedly before he will suffer her to pass with her load.

Make haste to secure the specimens you want of the males, put them in a small, dry vial and give them a drop of chloroform. If you pin them now, they won't have a wing left on their shoulders when you get home, so loosely are these appendages attached. Put a few soldiers in alcohol in a small vial, and you will have ample time to secure some of the brave little workers, who are so earnest in their duties that they have removed almost all the young to the vaults below. There are only a few left, at the extreme points of the gallery, and here are two or three ravening enemies, in the shape of true ants, seizing and carrying off to their own homes for food the tender young Termites. Where are the soldiers now? Like policemen, not to be found when wanted, they are safely ensconced within the chambers of the dwelling. But we will do them the justice to say that, had not the terrible earthquake (from their point of view) unroofed the edifice and bewildered their faculties, they would have boldly combated the piratical ants, and sacrificed unhesitatingly their own limbs and lives to save the helpless offspring of their queen. See this poor worker, with its feeble might endeavoring to rescue the little one from the powerful jaws of the marauder; regardless of danger and wounds, she opposes the two or three strong black kidnappers, but at last her soft body is gashed, and her tender limbs are torn off, by their powerful jaws—she has sacrificed her life in the vain attempt.

And now the surface of the Termite's home is deserted; most of the young have been saved; the soldiers are keeping guard in the subterranean galleries, and the workers are ministering to their little charges in the dark nurseries below. If we now dig a trench at the side of the space formerly covered by the slab, and slice off carefully, with a spade or large-bladed knife, the earth in thin sections, we shall get a fine view of the labyrinth of burrows, galleries and chambers of the Termite's home. We shall perhaps discover, in a large commodious chamber deep down near the centre of the dwelling, a large, soft-bodied female, the true mother of the next generation. Her head, thorax and limbs are about the size of those of the workers, but her abdomen is expanded to a prodigious size, making it impossible for her to leave her cell, in which she is carefully tended and fed by the workers. They remove also the young as soon as they are born, and take the entire charge of nursing them up to maturity.

Many naturalists believe the workers to be females which are unfit for becoming mothers; the development of the ovaries being arrested, and the insect remaining in an immature condition, devotes itself to the care of its companions. Some also consider the soldier as a sort of undeveloped male; and more than one student of zoölogy regards the soldier and worker as pupal forms corresponding to the chrysalis condition of the butterfly. These questions remain to be settled; and, as you will find in the pursuit of this class of studies, a vast field is open to every careful observer of Nature for investigation and study.

If you have been so successful as to find a female, deposit her carefully in a separate vial of alcohol, and, cutting out a cube of earth that contains the section of her cell, wrap it in your handkerchief, if you have not a box of the right size for it, and carry it in your hand; it is of sufficient value to be worth some labor and inconvenience in securing it for your cabinet. If you will preserve some of the workers and young alive in a small box with earth, or the fragments of their dwelling, you can place them under the compound microscope when you return, study the interior of their bodies, and witness the contraction and expansion of the great dorsal vessel that serves insects for a heart. Their beautifully transparent skin enables us to investigate their internal anatomy while their vital functions are in full operation.

You will find it most convenient to place the insect to be examined in a "live-box," as it is called, and if you have not got one, you can easily make a good substitute out of a strong pill-box and two round pieces of thin glass. Push the bottom of the box out, then fit both of the pieces of glass to the size of the *inside* of the cover; this you can easily do, if they are too large, by nipping off very small bits around the edge with a pair of common pliers. Now, cut a hole in the cover of the box, leaving enough of a rim to hold the glass cover pretty firmly; wipe both pieces of glass clean, and place the thicker, if there be any difference, in the cover. Put your specimen of *Termes* upon the middle of the glass, and lay the other piece of glass upon it; if the weight of the glass alone is sufficient to prevent its moving out of the field of view, you will not require the rest of the box; but if not, you will find, by gently pressing the box into the cover, that the friction is sufficient to hold the little insect without crushing it, or destroying life. A box for this purpose is generally made of brass; thinner glass is used in it than can easily be procured in most localities, and the cover slides or screws down upon the specimen. A skillful American boy can, without much difficulty, construct one of permanent utility of brass, softer metal, or even of wood, and will find it of continual benefit to him if he owns, or has permission to use, a compound microscope. He will find it a more convenient instrument to use if he solders the smaller ring of the live-box to a slip of metal about the size of an ordinary slide as cut for the microscope—that is to say, about three inches long by one in width, and not so thin as to bend readily. He must, of course, cut or file a hole in the centre of this piece of metal of nearly the size of the ring which is attached to it, and both surfaces of the slip must be smooth and even.

THE RANSOM CURCULIO REMEDY.

It is really laughable and amusing to those persons who have no particular "axe to grind," to calmly look on and watch the rankling discussions which have been caused by the announcement of Mr. Ransom's method of fighting the Curculio. And it is likewise passing strange how ridiculously partial and unjust bias will render a man, and how often it acts as a stumbling block to his clear and candid reason.

Dr. Hull, upon his return from St. Joseph, published an account of his visit, and gave us his opinion of the value of the new process. The facts as he found them are almost precisely as we stated them to be in our last number, but when he gets on to opinions, the warp of the mind is clearly manifest, and he evidently deems the new method of but trivial importance, as may be seen from the following paragraph, which we quote from that article—the italics being our own:

> A query here presents itself, and one, too, of much practical importance. For example: Supposing no bugging by traps or otherwise had been done, up to the very morning of the day when Curculios commenced stinging the fruit, and on that morning a Curculio-catcher or other contrivance for thoroughly jarring the trees had been used, would not all the Curculios have been taken which had previously come into the orchard and been trapped, together with those which did not enter the traps? This query seems to us all the more important from the fact that at the time Curculios began to sting, the peaches on those trees which had been most thoroughly bugged seemed to have Curculios enough on them to destroy all the fruit in a few days. If all the Curculios on entering the orchard would go down under the cover provided for them, then the new mode of catching them would be best, since the labor could be performed by women and children. But any method of catching which fails to take all the insects, would not lighten the labor of jarring the trees. We have long since determined that it makes no difference how many Curculios come together in the orchard for mating, or how long they are in doing so, provided the orchard is run in time to jar the trees twice before any of the fruit is stung. *For aught we can now see, jarring trees may safely be delayed as long when trapping is not resorted to as where it is; and for this reason, we cannot understand how results of much practical importance can be realized by laying traps for Curculios.*

Of course, Doctor, you cannot understand how any good is to result from this new method. Don't you see that the Curculio-catcher is in the way? But let us look at the other side of the question, for Mr. Ransom evidently views the matter in a different light, having but a few chips instead of a great machine, to intercept the clearness of his vision. We find in the columns of the same good old *Prairie Farmer* for June 11th, a long article from his pen, in which not one word can be found regarding the jarring process. On the contrary, the trap-remedy is held to be a "perfect success," and sufficient to save the fruit in the face of the many facts to the contrary that were confirmed both in his own and his neighbors' orchards before the article in question was written. There are a few statements in this article that will not bear criticism, but, with the exception of the apparent bias that pervades it, and a silly fling at the professional entomologist, Mr. Ransom has narrated some important personal experience, and we quote the last paragraph, which gives the gist of the whole:

> We have to gather some facts for future publication. I have devoted much time for a month in watching and discovering their habits, and have many facts, as well as theories, which I cannot put into this already much too long communication. One thing is certain—it has been a success. I feel confident they can be destroyed easily, and our fruit saved. The method of preparing around the trées, or which late in the season is as good, or better, of putting cloth, leather or anything for them to crawl into and hide in the forks of the trees, will be prepared and published in season for next year. I have many facts of importance.

It may be laid down as a rule, which will generally hold good, that editors are the most pugnacious of men—with their pens. A woman in her silken robes is vain; an Indian in his war-paint is vain; a turkey gobbler in his feathers is vain; but of all vain things on this earth of ours an editor is, perhaps, the vainest! There is scarcely one of them—from the scribbler for the penny novel to D'Israeli or Victor Hugo—who does not think his productions unequalled and unsurpassed; and he who would take exception to any of them must needs give mortal offense. It is not surprising, therefore, that the respective editors of the *St. Joseph Herald* and of the *Benton Harbor Palladium*, have had a pitched battle at pen's point on this Curculio remedy. Nor is it surprising that their mode of reasoning is far more vicious than that of the champions of the two different methods. It appears that Dr. Winans, whom we know to be a perfect gentleman and an excellent observer, recommended the Ransom process in the columns of the *Palladium*, and that the editor of that paper actually had the audacity to assert that "it was practiced many years ago in the central part of New York; but like many other discoveries seems to have been neglected and forgotten"! Whereupon the *Herald* cries, "shame"—"preposterous"—"this discovery ought not to be belittled by any one in the St. Joseph Fruit Belt." Of course the *Palladium* mildly replies to these cutting attacks, and the *Herald* finishes the discussion by reiterating in two different editorials that Mr. W. B. Ransom is the discoverer of the new method of Curculio EXTERMINATION [!!]. That paper likewise (very justly) takes considerable credit to itself, and implicates us in the following manner:

The *Herald* claims honor for what it did do. It claims that without its *Extra*, the *Palladium* would have attempted to steal the honor for some other one; that the jealous entomologists of Illinois and Missouri would have attributed the discovery to one of themselves, and for the proof thereof appeals to the intemperate article of the *Palladium*.

Now, we are perfectly willing that the parties should, like the martyrs mentioned in Don Quixote, each heroically frizzle on his own coals; but we do implore you, gentlemen, to "stop this pother," and, like men, admit the facts. The editor of the *Herald* does himself no great honor in the blind manner in which he vents his wrath on his bitter rival; but in making the astounding assertion that "the jealous Entomologists of Illinois and Missouri would have attributed the discovery to one of themselves," he makes himself supremely ridiculous, and simply pollutes his pen with the vilest slander. No doubt Dr. LeBaron is as capable as ourselves of proving that he had no grounds whatever for any such assertion.

With regard to the benefits accruing from this discovery, we must repeat what was said in our last number, namely, that it would be unwise in the extreme to rely on this method alone, and to abandon the jarring process. Since the method was first noised abroad it has been tried continuously by ourselves, by the horticultural editor and the Illinois correspondent of the *Country Gentleman*, by Dr. Trimble of New Jersey, by Dr. Hull, and by many other persons in different parts of the country, as well as at St. Joseph, and in every instance with the meagre and unsatisfactory results we predicted. *Per contra*, it would be equally unwise to follow the reasoning of Dr. Hull and abandon the Ransom method, for, from our own experience, we venture the assertion that it will prove the better remedy of the two for the million; first, on account of its cheapness and simplicity, and, second, because an energetic and united effort for a few days early in the season, will do much—very much—to lighten the subsequent summer's jarring in any given district.

As to who is entitled to the credit of the discovery, we reiterate our former opinion. As then stated, we have often captured Plum Curculios early in the season under chips, bark, and other sheltered situations, and so have other persons; but these facts do not in the least detract from the honor due Mr. Ransom, but, on the contrary, they reflect discredit on us for not being wise enough to make a practical application of them. With the case of Mrs. Wier, however, it is quite different. She not only captured a large number, but suggested the method to others through the columns of an influential journal; and although her suggestions have never since been worked upon, she nevertheless made the first discovery and applied it. It may be truly said that he who, by persistent appeal and untiring effort, succeeds in applying and introducing to public notice a new and valuable invention, deserves more credit than the inventor himself; and we repeat that all credit is due Mr. Ransom. All honor to him or to any man who will give to the fruit-grower any practical and hitherto unemployed method of destroying those insect pests which render fruit-growing so precarious. We presume he would not—supposing he could—claim any particular recompense for the valuable facts he has made public; but he can rest assured that an appreciative public will ever be grateful, and for our part we shall hereafter always speak of this remedy as the "Ransom Process."

Let it not for a moment be supposed that, as the *Herald* intimates, we envy any one who makes a discovery in economic entomolgy. No one but the veriest charlatan would ever entertain any such feeling. It is our province to disseminate the knowledge gained by others, and we take as much pleasure in doing so as in imparting what little we may have of our own. Our columns are free to all! To the practical culturist especially we say: learn to think and observe for yourself, and do not think these small "bugs" beneath your study and attention. The professional entomologist is constantly busy in studying the habits of the thousands of different insects that affect the general farmer and gardener, and he cannot devote all his time to experimenting with the few that more particularly affect one set of men without doing injustice to some other set. The unprofessional man, on the contrary, very often has to deal with but two or three species, and as he is battling with these constantly he is, of all others, best situated for studying and experimenting with them; especially if he has acquired some knowledge of entomology. A thousand pair of observing eyes, scattered over a wide extent of country, will accomplish far more than a single pair possibly can in any one locality; and to imbue the producer with a due sense of the great practical importance of such observations—to show how these studies will render his business more pleasant, as well as more profitable—in short, to incite the cultivator to observe and study these tiny and generally despised creatures, and to show him how best to do so, is, in great part, the mission of this journal.

More Upon the Same Subject.

Since the above article was written we have spent a few days among the well-cultivated, neat and thrifty orchards of St. Joseph and Benton Harbor, Mich., and among the plum orchards around London, Ontario. We were highly delighted with the thorough and intelligent manner in which fruit-culture is there carried on, and were glad to observe that due reward is attending their efforts. Last year they shipped by boat from St. Joseph, over 708,000 baskets of peaches, besides nearly 40,000 bushels of the smaller fruits; and the present year the latter have been abundant, and there is a very fair crop of the former, with the exception of the late Crawford, which has overborne for the three preceding years.

Our visit was made partly to examine more closely into Mr. Ransom's Curculio remedy, so as to give our readers the benefit of full and impartial instruction. We found that so few Curculios had been caught under the chips after the first week in June, that nearly everybody, except Mr. Ransom, had for some time abandoned the method, and were jarring their trees. In fact, it has turned out very much as we predicted it would. Consequently most of the extensive growers are using a Curculio-catcher, and Mr. L. M. Ward has made some improvements on Dr. Hull's machine, which, in our estimation, render it so much more useful and valuable, that we shall give a description of it as soon as the proper figures can be engraved.

Mr. Ransom himself, by dint of unusual perseverance and great care in setting his traps, has had much better success than we had expected he would. On the 15th June he caught 78; on the 16th, 97, and on the 17th, 71. For about a week after this, he scarcely caught any, but from the 24th to the 27th inclusive, he caught about 300. On the 6th of July we accompanied him around the outside rows of his orchard and caught five under the traps. We had no opportunity to use the sheet, but are satisfied that more could be jarred down. Mr. R. has a very fair crop of peaches, and—forgetting that crops have often been grown before with very little care, and that others around him who have not bugged so persistently have fruit also this year—is very sanguine of his new method, and too much inclined, perhaps, to attribute his crop solely to this remedy. Nevertheless, contrary to the impression made by his published views, he was candid enough to admit that it might be found necessary to resort to the jarring process, after a certain season of the year; and indeed the number of stung peaches on the ground showed too plainly that there is no hopes of EXTERMINATION by the chip plan alone. The soil around St. Joseph is, for the most part, a light sandy loam, never packing, and very easily kept in good cultivation. To this character of the soil must be attributed much of the success with the Ransom method; for we are satisfied, after full experiment, that in the warmer climate and heavier soil of St. Louis, it is of no practical use after the middle of May, or at the farthest, after the first of June. The few specimens that we have captured by this method at St. Louis, have been found under small pieces of new shingle; and Mr. W. T. Durry, who has 2300 trees in his orchard at St. Joe., also found this the best kind of trap. Mr. Ransom, however, prefers small pieces of oak-bark, which he places close around the tree with the inner or concave side appressed to the ground. Stones do not answer well, and corn-cobs are objectionable because it requires so much time to discover and destroy the Curculios, which hide in their deep cavities.

Mr. D. N. Brown has apparently suffered more this year from the Curculio than any one else. He made the great mistake of supposing that there were none in his orchard early in the season; and ere he commenced to battle with them they had become a mighty host. After killing the beetles, he throws into barrels all the fruit which falls or is jarred off. In escaping from the fruit the worms naturally collect at the bottoms of the barrels, where they are killed by pouring water on them. The many barrels of shrivelled, shrunken and rotting fruit, spoke plainly of Mr. B.'s untiring efforts, and of the immense work he had on hand. We doubt if he will ripen a single plum.

Passing into Ontario, we found the plum-trees overloaded with fine, unblemished fruit, and the contrast was great indeed. We found our friend, Mr. Wm. Saunders, of London, also much occupied with, and interested in, the Curculio question. He was, in fact, carefully counting different lots of this insect which had been received from different parts of the Dominion; for be it known, that the enterprising Fruit-Growers' Association of Ontario, in its praiseworthy efforts to check the increase of the Curculio, offered *a cent per head* for every one which should be sent to our friend, who happens to be secretary of that body. What would the people of the Western States think, if their different Legislatures, or their State Horticultural Societies should offer an equally liberal premium *per capita* for every little Turk captured? Wouldn't they set about capturing them in earnest, though! The Legislature might stand it, and we are not sure but that some such inducement, held out by the State to its fruit-growing citizens, would pay, and prove the most effective way of subduing the enemy. But the Horticultural Society that should undertake it, would have to be pretty liberally endowed. Just think of it; ye who catch from three to five thousand per day! The bugs would pay a good deal better than the peaches. However, very fortunately for the Ontario Fruit-Growers' Association, their good offer did not get noised abroad as much as it might have been, and the little Turk occurs in such comparatively small numbers, that up to the time we left only 10,731 had been received.

We have much else to say, and some important facts to communicate about this destructive insect, but must defer till our experiments are completed at the end of the season. Besides the parasite which we bred through the kindness of Dr. Trimble, we have discovered another which has this year destroyed nearly two-thirds of the Curculio larvæ around St. Louis.

A NEW HESPERIAN.

An undescribed species was found by the writer, abundantly, on a grassy prairie slope, at Grinnell, Iowa, June 21, 1870. Thirty-one ♂, two ♀ were taken, all fresh. I have named it from the county, which was named from a friendly chief of territorial times. It is of the size of *Hobomok*, without spots, and is dark brown, with ochre-yellow on front border and nerves of fore wings; the underside of the hind wings is thickly powdered with pale yellow or ashy-white, with conspicuous white veins. The writer would exchange for butterflies not referred to in his list in the AMERICAN ENTOMOLOGIST, April, 1870. The following is a more particular description of this new species:

HESPERIA POWESHEIK—N. SP.—♂ and ♀. Expands 1.16—1.26. Primaries trigonal, the edges nearly straight, angles but slightly rounded, and the length of the costal border to the internal as 68 to 40. Secondaries more rounded. Ground-color of both wings, above and beneath, silky dark brown, with a purplish gloss. Primaries are ochre between the costal edge and subcostal nerve, the color narrowing and shading off near the apex, where it appears mostly, if at all, on the nervules, as it does also brokenly and in varying amount on the basal half or more of the other nerves, nervules and internal border. Sometimes the yellow scales encroach on the interspaces. Secondaries with long yellowish hairs, tinged green or brown in different lights, on the basal and central area. Fringe on both wings, above, is black in most ♂ specimens, with an intermixture of yellowish-white and ashy scales on the primaries, except near the angles; in a few individuals this intermixture, with pale roots and tips, occurs on both wings, more distinctly so in one of the two ♀♀ collected, the fringe becoming almost wholly gray in the other.

The underside of the primaries has the costal color somewhat narrower and paler, and the color is still paler as it is carried around the apex, whence it extends, most often narrowly, two-thirds the length of the external edge, shading into the ground color towards the disk; and there is a similar but lighter color on the branches of the subcostal and median nerves, sometimes almost gray. The underside of the secondaries is occupied by ochrey hairs and scales between the costal edge and costal nerve, and has a thick sprinkling of either pale yellow or hoary white (variable) in all the interspaces except a segment between the internal nerve and the second nervure therefrom, widening of course from the base to the exterior edge, where it occupies one-third of the marginal length; this space is wholly dark brown. All the other nervures are conspicuous with hoary white, and the internal border likewise. At a little distance, the surface generally seems to be nearly white.

The body, of the same length as the secondaries, is of the ground color above, with profuse yellow hairs on the sides of the thorax and top of the head, and is white and hairy beneath. The hairy palpi, the antennæ and the legs simply *correspond* in all particulars with the coloring of the body, above, laterally and beneath, with the exception that the legs have not a dark shade of brown, and the short antennæ, which are clubbed only, show mostly the yellow, and are not annulated. On the posterior legs are two pairs of short spurs, the lower equal, the upper differing in length by one-fourth. White encircles the eyes, obscurely so above.

The ♀ differs from the male in a larger proportion of light color in the fringe, above and beneath. In both, on the inferior surface, the basal half of the fringe is ashy white, then nearly black, and barely tipped with yellowish white. The ♀ antennæ show annulations.

This Hesperian agrees in some striking points with *H. alternata*, Gr. and Rob. (Georgia) Trans. Am. Ent. Soc., Vol. I, page 3, but has marked differences. H. W. Parker.

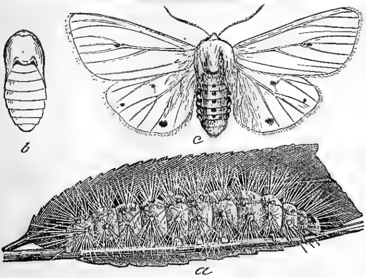
Grinnell, Iowa, June 23, 1870.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 10.

The Common Yellow Bear.

(*Spilosoma virginica*, Fabr.)

[Fig. 170.]



Colors—(*a*) Yellow or brown; (*b*) shiny brown; (*c*) white, black and orange.

This is one of our most common North American insects. The moth (Fig. 170, *c*) which is very generally dubbed "the Miller," frequently flies into our rooms at night; and there are quite a number of our Western farmers who, somehow or other, have got the idea that this "Miller" is the insect that infests their bee-hives—that it is, in short, the Bee-moth. Of course no such ridiculous idea could for a moment prevail among the readers of the Entomologist; but, unfortunately, there are yet many good souls in the country who think they know all about Bugs, and who would scout the idea of taking a journal devoted primarily to the history and habits of these little beings.

Though the moth is so common, how few persons ever think of it as the parent of that most troublesome of caterpillars, which Harris has so aptly termed the Yellow Bear (Fig. 170, *a*). These caterpillars are quite frequently found on the Grape-vine, and when about one-fourth grown bear a considerable resemblance to the mature larva of the Grape-vine Plume figured in our last number. They seldom appear, however, till that species has disappeared, and may always be distinguished from it by their semi-gregarious habit at this time of their life, and by living exposed on the leaf (generally the under side) instead of forming a retreat within which to hide themselves, as does the Plume.

The Yellow Bear is found of all sizes from June to October; and though quite fond of the Vine, is by no means confined to that plant. It is, in fact, a very general feeder, being found on a great variety of herbaceous plants, both wild and cultivated, as butternut, lilac, beans, peas, convolvulus, corn, currant, gooseberry, cotton, sunflower, plantain, smart-weed, verbenas, geraniums, and almost any plant with soft, tender leaves. These caterpillars are indeed so indifferent as to their diet, that we have actually known one to subsist entirely, from the time it cast its last skin till it spun up, on dead bodies of the Camel Cricket (*Mantis carolina*).

When young they are invariably bluish-white, but when full-grown they may be found either of a pale cream-color, yellow, light brown, or very dark brown, the different colors often appearing in the same brood of worms, as we have proved by experiment. Yellow is the most common color, and in all the varieties the venter is dark, and there is a characteristic longitudinal black line, more or less interrupted, along each side of the body, and a transverse line of the same color (sometimes faint) between each of the joints: the head and feet are ochre-yellow, and the hairs spring from dark yellow warts, of which there are 10 on each joint, those on joint 1 being scarcely distinguishable, and those on joint 12 coalescing. There are two broods of these worms each year, the broods intermixing, and the last passing the winter in the chrysalis state. The chrysalis (Fig. 170, *b*) is formed in a trivial cocoon, constructed almost entirely of the caterpillar's hairs, which, though held in position by a few very fine silken threads, are fastened together mainly by the interlocking of their minute barbs, and the manner in which the caterpillar interweaves them.

The moth makes its appearance as early as the first of May in the latitude of St. Louis, but may often be found much earlier in stove-warmed rooms. It is easily recognized by its pure white color, by its abdomen being orange above, with three rows of black spots, and by the black dots on its wings. These dots vary in number, there being usually two on each of the front and three on each of the hind wings, though sometimes they are all more or less obsolete, except that on the disk of the front wings.

It is fortunate for us that this caterpillar is attacked by a large number of insect parasites;

for, were this not the case, it would soon multiply to such a degree as to be beyond our control. We know of no less than five distinct parasites which attack it—some living singly in the body of the caterpillar, and issuing from the chrysalis without spinning any cocoon of their own; others living singly in the body, but forming a cocoon of their own inside the chrysalis of their victim, and still others infesting the caterpillar in great numbers, and completely filling the chrysalis with their pupæ.*

The best time to destroy these worms is soon after they hatch from their little round yellow eggs, which are deposited in clusters; for, as already intimated, they then feed together.

With the exception of the Grape-berry Moth (*Penthina vitivorana*, Pack.†), of which we gave an account, which it is needless to repeat, on pp. 177–179 of our first volume, we have now described all the insects belonging to the Scaly-winged flies (*Lepidoptera*) that can be considered injurious to the Vine. There are several other species of Lepidoptera which may occasionally be met with in the vineyard, but they are either very general feeders, which only exceptionally stray on to the Vine, or of such rare occurrence that they cannot possibly be included in the list of Grape-vine depredators. In our next we shall commence on the different Beetles (*Coleoptera*) that belong to this list of bad Grape Bugs.

* For the benefit of the scientific reader we enumerate the five parasites which we have ascertained to infest this caterpillar: 1. *Anomalon flavicorne* (Brulle, Hym. IV, p. 171). 2. *Ichneumon subcyaneus*, Cress. (Proc. Ent. Soc. Phila., III, p. 148), and *Ich. pullatus*, Cress. (Pro. E. S. P., III, p. 146), described as distinct species, but *pullatus* is evidently the male and *subcyaneus* the female of the same species, as we have bred from *Spilosoma virginica* three males all answering to the description of the former, and two females both answering to the description of the latter. 3. *Ichneumon signatipes*, Cress. (Trans. Amer. Ent. Soc., I, p. 308). 4 *Ophion bilineatus*, Say. (Ent. of N. A., I, p. 379). 5 A small undetermined, and probably undescribed, Dipteron belonging to the MUSCADÆ.

† Mr. P C. Zeller, of Stettin, Prussia, after examining specimens of our N. A. species bred from grapes, informs us that this moth is nothing more than the European *Lobesia botrana*, which has long been known to injure grapes in Southern Europe. Our Grape-berry Moth is therefore an imported species, and, in accordance with the law of priority, must henceforth be scientifically known by the European name. Thus we have still another of our most injurious species to add to the list of Imported Insects, and there is so great a similarity between our insect fauna and that of Southern Europe, that a knowledge of their species is often of great advantage in determining our own.

IN a lecture on "Insect Pests," delivered by Mr. Treat, before the Vineland Agricultural and Horticultural Society, the lecturer advised his hearers to carry all the toads they can find into the garden, as they devour immense quantities of insects. A toad will swallow the largest specimen of a tomato worm, although sometimes he evidently has a hard time of it.

ERRATUM.—Page 244, col. 2, line 24, for "(*C. thyoides*)" read "(*C. disticha*, Linn.)"

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

CYPRESS-GALL—THE WRONG TREE.—*Savannah, Tenn., June* 24, 1870.—The Cypress-gall which I sent you, and which you figured and described on page 244 of this volume, was taken from the *Taxodium distichum* of Richard (*Cupressus disticha*, Linn.) instead of the *Cupressus thyoides* of Linnæus, as stated in the description. The latter, growing in the lower Southern States, is a small tree known to us by the common name of White Cedar, while the former is our Cypress of the swamps—the only tree we refer to as Cypress when not talking science. I take all the blame to myself, for the mistake doubtless grew out of my neglect to mention upon what kind of cypress the gall occurred.

J. P. S.

FIGHTING CURCULIO—*Centralia, Ills., May* 18, 1870.—We have made a grand war on the Curculio, and I think have saved our peach crop. The Little Turk has been caught here by thousands this season, and we never had so fine a prospect. M. M. HOOTON.

RADISH MAGGOTS—*Newark, N. J. June* 8, '70. —I send you some pupæ of Radish Maggots. These maggots spoil the greater part of my first crop of radishes, operating a little below the surface of the ground. At first there is a streak, slightly discolored, near the centre of the radish about an inch under ground, and soon there will be a depression opposite that part. In a little time this part of the radish will be compressed in size, and within, it will be perforated through and through, just as the apple is with the Apple Maggot (*Trypeta pomonella*, Walsh.) Radishes planted later do not suffer. We now have the second planting, and it is almost free. I gathered the whole crop that was infected, putting them in boxes of earth, and then covered them about two inches with more earth, and I have hundreds in the pupa state—some to send to you, more for myself, and still more for some pet chickens that follow me closely in all my garden operations. Occasionally I have to shoot some roving tom cats, that think young chickens their game. Such dead cats I allow to lie in the walks, as a warning to other cats, till they become too offensive to be longer above ground. They are then buried about a foot deep. In eight days more, if the weather is hot, the little chickens scratch over those graves from morning till night. Sometimes I help them with a hoe, and how we do find maggots, and how the chickens do grow as long as the maggots last! What think you about the morality of the transaction? The maggots eat the cats, the chickens eat the maggots, and we eat the chickens—so it goes. I feel no compunctions till it comes to killing the chickens.

I. P. TRIMBLE.

[These Radish Maggots we have long since been acquainted with. They are the larvæ of the Radish-maggot Fly (*Anthomyia raphani*, Harr.), a little ash-colored, two-winged fly, with a silvery gray face and copper-colored eyes. The best way of destroying them is by means of hot water.—ED.]

CHIP-TRAP CURCULIO CATCHING—*Newark, N. J.*—You are right in stating that the St. Joseph method of catching Curculios can only be useful during a few days early in the season. I have been testing this trap business in the fruit orchards of my friend Pierson, following all the directions given. I catch a few spiders, a good many *Iules*, but never a Curculio.

I. P. TRIMBLE.

DEPTHS TO WHICH CICADAS GO—*Savannah, Tenn., June* 16, '70.—I am now operating in the Indian mounds for the Smithsonian Institute, and in digging we frequently take up *Cicada* pupæ from the solid earth, from six to nine feet below the surface. J. P. STELLE.

EGG OF IMPORTED CURRANT-WORM NOT INSERTED IN LEAF—*London, Can.*—I have looked into that matter I referred to before, regarding the eggs of *Nematus ventricosus*, and have fully satisfied myself that they are not imbedded in the leaf-stalk at all, but fastened very slightly to the surface. WM. SAUNDERS.

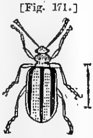
ASH-GRAY BLISTER BEETLE ON BEANS—*Chicago, Ills., June* 24, '70.—I raise in my garden two patches of a large bean, which is little known here. It is eaten green, and known in Germany by the name of "Grosze Bohnen." I have had the greatest trouble to save them, and have picked off thousands of *Lytta cinerea*, Fabr., every morning. It is wonderful how they continue to come in a straight line, pouncing on the leaves and greedily devouring them. I have wondered how they manage to find out a strange plant so unerringly. CHAS. SONNE.

[Mr. Walsh, many years ago, had a similar experience in attempting to raise this bean, which is popularly known as the English Broad Bean. He found it almost impossible to keep off those Ash-gray Blister-beetles. They must, we think, be guided by an exquisitely keen sense of smell.—ED.]

THE THREE-LINED POTATO BEETLE—*Amesbury, Mass., June* 26, 1870.—Enclosed I send you specimens of insects that are injuring my Early Rose potato vines to a considerable extent. The Round Reds have a few individuals of the slugs (as I call them), and considerable numbers of the beetle. My attention was first called to the Early Rose vines by seeing the leaves curled upward from the sides to the centre; others were rolled up on one side, and were dead and dry. While opening the leaves, my attention was called to the enclosed striped beetle, which I at first took for the Striped Cucumber Beetle, but, on catching one, its red body and dark brown stripe, in place of the black body and straw-colored stripe of the Cucumber Beetle, showed me the mistake. On looking further, I found scores of them, some feeding singly, others coupled, on the vines. I found small nests of eggs in double rows, which I take to be the eggs of the beetles. In hunting for the beetles I first discovered the slugs, which were covered with their own excrements, and were of different sizes, some quite small and others full grown. I have never met with this insect before, and have asked one or two other persons about them, but no one seems to know them. Please inform me what they are. JASON E. COWDEN.

[The insect is the Three-lined Leaf-beetle (*Lema trilineata*, Olivier), a portrait of which we herewith reproduce (Fig. 171). A full account of it, with illustrations, may be found on page 26 of our first volume. A second brood of the larvæ, or slugs, will appear in August. So, be prepared for them.—ED.]

[Fig. 171.]



Colors—Pale yellow and black.

TROUT WEB-WORM—*Mumford, N. Y. June* 10, '70.—After I wrote to you last about Seth Green's "spinning worm," I endeavored to obtain some more specimens; but a slight rise of water in the stream seemed to have the effect of sweeping them all away. Now, however, a new batch is making its appearance. The worms are to be seen by thousands on the stones in swift running water. I am endeavoring to hatch some of them out, and will soon send you (if I am successful) specimens of the worm, the case and the fly. I will pack some in glycerine, and also endeavor once more to send you some alive.

A. S. COLLINS.

[Our correspondent, Sarah J. McBride, of your town, has, by praiseworthy perseverance, succeeded in rearing the perfect fly from these Web-worms, and has been kind enough to send us specimens. It is, as we supposed it would be, a species of *Simulium*, and appears to be an undescribed species. As soon as we can find time to make the proper investigations, we shall publish a description of it.—Ed.]

THE WALSH ENTOMOLOGICAL CABINET.

We are very glad to learn that Dr. LeBaron has at last been successful in getting the State of Illinois to purchase the valuable collection of our late associate. We have not yet received any particulars of the purchase; but the cabinet has been temporarily deposited in the museum of the Chicago Academy of Science. There may it long remain! No better place could be found for it. Accessible as it is from all parts of the State; secure in a perfectly fire-proof building, and guarded by a curator who can appreciate it—we rest satisfied of its safety. Moreover, those excellent and experienced entomologists, Messrs. Charles Sonne and A. Bolter, will take pride in its proper preservation, in memory of him who with his own hands prepared each specimen.

The Currant Worm!—Some of our more pretentious horticultural exchanges are still giving to their readers effectual remedies for THE Currant-worm, and publishing accounts of how IT was kept from the red and white currants by interspersing them with bushes of the black variety. When will they learn that there are three distinct Currant-worms, and that what applies to one will not always apply to the others? We expect such looseness from correspondents, but editors ought to be able to give their readers more precise information.

☞ In speaking of the time of year in which an insect first makes its appearance, in one stage or another, we have reference, unless otherwise stated, to the latitude of St. Louis. It may be laid down as a rule which will almost invariably hold good, that the same insect will appear about a month earlier as far south as South Carolina, and a month later as far north as Vermont and New Hampshire.

☞ Our notices of new books and pamphlets received, as well as many "Answers to Correspondents," are unavoidably crowded out of this number, for want of space. Such of the latter as are most urgent we shall send by mail. Articles that have been communicated will be published as soon as possible, unless returned.

☞ Those who do not understand why the present number covers the months of July and August, will bear in mind that the volume of twelve numbers is to end with the year.

ANSWERS TO CORRESPONDENTS.

Notice.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the Entomologist, but when there are many we shall answer by mail.

Water Larva—*Fred. Mather, Honeoye Falls, N. Y.*—The aquatic larva which you found with young trout was too much injured to enable its proper recognition; but, from the fragmentary tail appendages, we suspect that it was the larva of some species of May-fly (*Ephemera*). These larvæ hide themselves in holes in the banks of ponds and rivers, and feed on other minute aquatic animals.

Insects in Corn Roots—*C. R. Edwards, Bowling Green, Ky.*—The corn roots you send seem to have been injured by some borer. We found a few maggot larvæ of some Two-winged Fly in one which was rotten, but incline to the belief that they were produced after the stalk was killed by the original depredator. We should like further specimens of these diseased roots, containing, if possible, the culprit.

Large Black Potato Beetles—*R. S. Elliott, Industrial Ag't, Wilson Creek Station, Kansas Pacific R. R.*—The large black beetles, which are so effectually stripping the potatoes between two and three hundred miles west of Kansas City, reached us in such a putrescent and mutilated mass, that, notwithstanding our olfactory nerves have been well trained to endure such things, we were glad to fling the beetles very far from us the moment the lid was opened. From the glimpse we got of them, however, we have not much doubt but they are a large black species of Blister-beetle (*Epicauta corvina*, Lec.) common to Colorado and the West. Try and send us other specimens in alcohol, and not in an empty box.

Destroying Cherry Plant-lice—*G. C. Brackett, Lawrence, Kansas.*—The same methods employed to destroy other plant-lice will prove effectual in destroying the Cherry Plant-louse. Your method of dipping the extremities of the limbs in a weak solution of "concentrated lye" is good, but you could do much better work by obtaining a garden syringe, and doucheing the trees with the same solution, or with whale-oil soap-suds, or even tobacco water. Dr. Hull, of Illinois, recommends dusting slacked lime on the trees when the dew is on.

Caterpillars on Grape Vines—*Geo. A. Watson, Maysville, Ky.*—One of the caterpillars found on your Grape-vines is the larva of the 8-Spotted Forester, which we recently figured (Fig. 100. p. 150). The other is the larva of a speckled gray moth (*Acronycta oblinata*, Sm. & Abb.), a very common species, found on a great variety of plants, and especially on the common Smart-weed.

Ash-gray Blister Beetle—*P. H. Foster, Babylon, N. Y.*—The beetles found feeding on the Three-thorned Acacia (*Gleditschia tricanthos*) are the Ash-gray Blister Beetle (*Lytta cinerea*, Say).

Specimens Lost—*C. H. Roberts, Poughkeepsie, N. Y.*—The specimens you sent escaped on their way, as we found no signs of insects in the peaches. From your description of it as a "dark brown worm which bores into the stems of peach trees, and into the peaches themselves," we conclude it must be one of two insects; but of course there is very little use in guessing, and we shall therefore be glad to receive other specimens. The striped livid-brown and yellow larva of *Gortyna nitela*, known popularly as the Stalk Borer, infests peach twigs as well as the stems of a variety of other plants (See A. E., I, p. 206). But there is another smaller brown worm that is doing considerable harm the present year, which infests both the fruit and twigs. This worm produces a small, dark-gray, undetermined moth, of which we have lately received specimens—bred from the twigs of the peach and the fruit of the nectarine—from Mr. J. Pettit, of Grimsby, Ontario. This last is, in all probability, the insect which has troubled you.

White Willow Worm—*S. H. K.*—The black, slug-like worms, with six black horny legs and fourteen pale blue prolegs, and ornamented with a row of twelve cream-colored spots along each side, are the larvæ of a small black four-winged fly, known as *Nematus ventralis*, Say. Its transformations were first described by us, in an old number of the *Prairie Farmer*. This insect is quite abundant the present season in many parts of Missouri. It occurs on different species of willow, but being very partial to the white willow, it may appropriately be called the White Willow Worm. The same remedies used for the Imported Currant Worm (*Nematus ventricosus*), or for the common Rose Slug (*Selandria rosæ*), will prove effectual for this willow worm.

Bark-lice on Grape-vine, and Raspberry Saw-fly—*Saml. Thompson, M.D., Albion, Ills.*—The large brown scale-insects on your Grape-canes are the Grape-vine Bark-louse (*Lecanium* [*Pulvinaria*] *vitis*, Linn.), a tolerably common insect both in this country and in Europe. The white cottony substance encloses the eggs of the female, and these eggs were hatching when they reached us. The translucent green, sprangling, false-caterpillar on the Raspberry is, in all probability, the larva of the Raspberry Saw-fly (*Selandria rubi*, Harr.), and may easily be destroyed by dusting with air-slacked lime, or what is better, with white hellibore.

Canker-worm Trap—*J. B. Hambly, Portsmouth, R. I.*—Thanks for your description of the trap used in your neighborhood. It is good, but too expensive, and there are several others, both patented and unpatented, which are preferable for many reasons. We cannot, therefore, publish your description; else our columns would soon be flooded with many others from parties interested.

Chrysalids Named—*S. W. Garman.*—The chrysalids of which you send sketches are—1st, that of the Girdled Sphinx (*Macrosila cingulata*, Linn.); 2nd, that of either the 5-Spotted Sphinx (*S. quinquemacalata*, Haw.), or of the Carolina Sphinx (*S. Carolina*, Linn.)

Specimens Lost—*N. S. Mead, Chandlerville, Ills.*—The Alder-galls you speak of never came to hand. Try and send more.

No Pins for Sale—*S. H. K., Clarinda, Iowa.*—We have no pins for sale. See what was said in answer to "G. C. B." on page 245.

Apple-tree Borer; variations in the Two-striped Saperda—*D. B. Wier, Lacon, Ills.*—You send figures and description of the perfect form of a Round-headed Apple-tree Borer, bred by you from a Duchess of Oldenburg. This specimen has the whole underside pearly-gray, and has two cinnamon-colored spots on the shoulders, one on each of the white bands, and you think that, as these characters are not mentioned by Harris, your beetle must be distinct from the *Saperda bivittata* which he describes. Such, however, is not the case, and your specimen is but a variety of Say's *Saperda bivittata*, the same insect which was previously named *candida* by Fabricius. We have often beaten this variety from Crab-apple trees, as well as the variety described by Harris, which has no shoulder spots and is pure white underneath; and if you had bred fifty specimens instead of a solitary individual, you would doubtless have found both forms. The variety with the spots is, if anything, more common in the West than that without them; but the latter is by far the most common in the Eastern States, owing, perhaps, to the fact that the thorn bushes have become more scarce there. Some Eastern entomologists, not aware of the above facts, have attempted to grind out two species from these two forms, but the fact that individuals are frequently met with by collectors, with a spot on one elytron and none on the other, is sufficient to prove that the spots have no specific value. The Tarnished Plant Bug (*Capsus oblineatus*, Say), which has injured your crops to the amout of $1,000, is very common this year all over the country. We shall have something to say about it in our next number.

The Plum Curculio Breeds in Apple—*E. Leming, South Pass, Ills.*—The eight Curculios which you bred from five apples are the genuine Plum Curculio (*Conotrachelus nenuphar*). The assertion which Dr. Hull is said to have made to the people of St. Joseph, Mich., namely, that this insect does not breed in the apple, is, of course, erroneous. He made the same strange assertion in his essay on the Curculio, and in *Tilton's Journal of Horticulture* for June, 1868. Since 1867 we have repeatedly bred it from apples, and published the fact on page 114 of the transactions of your State Horticultural Society for that year.

Cecropia worm—*J. F. Thompson, Corinth, Miss.*—The immense worm which sometimes strips your apple-trees, is the Cecropia worm, of which we recently gave a portrait (Fig. 62, p. 100).

Gigantic Rhinoceros Beetle—*L. G. Shaffer, Elizabeth, Ind.*—The immense beetle you send is a dark variety of the Gigantic Rhinoceros-beetle (*Dynastes Tityus*, Linn.) Some specimens are uniformly dark brown; others pale green, with but a few black blotches.

Roman-nosed Pupa—*E. D. Van Winkle, Pleasant Hill, Kans.*—The pupa found attached to a Siberian Crab, and of the exact form of one given in our last number (Fig. 155), belonged either to the Ursula Butterfly (*Limenitis ursula*) or to the Disippus Butterfly (*L. disippus*). It was dead when it reached us; but, from the fact that *Ursula* often feeds on the Crab, while *Disippus* is confined more especially to the Willow family, it may with tolerable assurance be referred to the former species.

Botanical Department.

DR. GEORGE VASEY, EDITOR, Richview, Ills.

ORIGIN OF PRAIRIE VEGETATION.

Various theories have been propounded to account for the existence of the Western prairies. By some they have been attributed to the annual burning of the grass by Indians; by some to the extreme fineness of the prairie soil, and by others to humidity and sourness of the soil, &c. One of the most recent theories on this subject is that of Prof. Winchell, whose views are developed in an article in the *American Journal of Science and Art*, Nov., 1864; and again presented, somewhat amplified, in his recent work, entitled "Sketches of Creation."

These views are peculiar, and as the points involved come somewhat within the field of our department, we propose to discuss the principal propositions which Prof. Winchell advances.

The first proposition is that "the prairies are of lacustrine origin;" from which statement we see no reason to dissent, especially as it appears to be the view entertained by geologists generally.

The second proposition is that "lacustrine sediments contain no living germs." This is a somewhat sweeping assertion. Let us consider it a moment. It is well known that lake borders are the chosen locations of very extensive vegetation. Wherever there is a shallow margin, some species of plants find a favorite home. Extensive patches of gigantic bulrushes (*Scirpus validus*, Vahl) grow in water six or eight feet deep, and stretch up several feet above the water, spreading out in many cases a mile inward. Great beds of Water-lilies (*Nymphea* and *Nuphar*), and allied plants, spread their broad leaves and expand their beautiful flowers on the bosom of the tranquil lake. Numerous kinds of Pond-weeds, (*Potomageton*) Eel-grass, Water-weed (*Anacharis*), &c., form large subterranean meadows, through which the canoe of the Indian finds it difficult to penetrate. Here, too, on the lake margin, the Indian finds his spontaneous fields of wild rice (*Zizania aquatica*, L.) *Sagittarias*, *Sparganiums*, and water weeds of various kinds, inhabit the shallow borders in abundance. Every year these plants mature an immense crop of seeds, which, excepting such as are devoured by birds and other animals, fall into the water, and generally by their own gravity sink to the bottom, where they find, in the soft mud, a suitable place for their future germination. We know not how many of these seeds are carried out into the deep portions of the lake, beyond the reach of those conditions necessary to their growth. Evidently Nature intended these seeds to germinate at the bottom of the shallow lake margin, and the only means they have for reaching that locality is their specific gravity. As in the case of land plants, Nature provides a surplus of seeds in order to insure a continuance of the species in spite of all ordinary contingencies.

We then present a counter-proposition to that of Professor W., viz: that lacustrine sediments *abound* with living germs. We do not, however, desire to make use of this proposition in accounting for the vegetation of the prairies, for whenever our lake bottom is drained it furnishes no longer the conditions necessary for the germination and growth of these plants, and the seeds would probably soon perish. But, whenever the soil is thus drained, the aquatic plants are speedily succeeded by others adapted to the new circumstances, the germs or seeds of which are introduced from outside.

The third proposition of Prof. Winchell is as follows: "Diluvial deposits, on the contrary, are found everywhere replete with living germs." By diluvial deposits we understand those collections of sand, gravel, clay, &c., which have been carried down by floods, or heaped together by violent action of the sea, or have been plowed up before the onward march of glaciers. Such deposits, Professor W. says are *replete* with living germs. In other words, they are filled with living seeds. This proposition is illustrated by some examples which seem pertinent, and by some which do not.

It is stated that forests cleared of their timber are almost "always followed by the appearance of certain unwonted plants known as fire-weeds, and it can hardly be doubted that the germs existed in the soil ready to germinate whenever free sunlight, warmth and atmospheric air should be permitted to rouse their vital energy." The term fire-weed is commonly rather loosely applied to several different plants, chiefly to those botanically known as *Erechtites hieracifolia* and *Erigeron canadense*. These are almost as common as thistles, and like them have light feathery seeds, adapted to be carried to great distances by winds. Now, it appears to us to be a good rule to explain any phenomenon by the simplest and most obvious causes; and to our mind it seems much more natural to account for the appearance of the fire-weeds by the introduction of the seeds by means of winds, than to do so by supposing that the seeds of those plants had lain dormant in the earth for generations.

The appearance of the Loblolly Pine upon abandoned plantations in the Southern States presents to our view no greater difficulty. The Professor inquires, "Let the waters of a brine saturate a meadow, and how long before we would witness the appearance of *Scirpus maritimus*, *Triglochin maritimum*, or some other salt-loving plant, whose germs, unless spontaneously developed, must have lain dormant in the soil at a greater or less depth." We cannot answer the inquiry as to how long, but we feel well assured that so much time will elapse that we shall not have to accept the dilemma of spontaneous generation or preëxistent germs. One of the plants mentioned, *Triglochin maritimum*, is not well chosen inasmuch as it occurs in various places in the interior of the country, from the Atlantic to the Rocky Mountains, without any regard to salt springs. It is true that, in the vicinity of salt springs in the interior, we often find plants which are otherwise confined to the sea coast, but this is not more difficult to explain than the occurrence of strictly Alpine plants on widely separated mountain peaks. We will not undertake to say how every mountain, sea, river, lake, forest and plain is first stocked with its appropriate vegetation. We confess ignorance.

Again, Professor W. says: "How soon does a dressing of undecomposed muck or peat develop a crop of acid-loving sorrel, and how readily it is again repressed by a dressing of some alkaline manure." Now, we are not very well informed in agricultural chemistry, nor in practical agriculture, but we would like to know if this method of producing and destroying sorrel can be relied upon, particularly in a country like ours, where sorrel (*Rumex acetosella*) is considered to be a foreign weed. We know plenty of places where it has made its appearance without any such agency, and have no doubt that many unfortunate farmers will be overjoyed to learn that it can be easily *repressed*, if not *eradicated*, by the application of a dressing of alkaline manure.

One more assertion under this proposition deserves notice, it is this: "Earth thrown out of cellars and wells is generally known to send up a ready crop of weeds, and not unfrequently of species previously unknown in that spot." This statement is unsustained by any instances, except under the next proposition, where a case is related of the appearance of some Beach-plum trees on ground that had been covered by sand brought up from a well at the depth of twenty feet. It is concluded that, inasmuch as no other Beach-plum trees were known to be within forty miles of the place, the seeds of these trees must have been brought up with the sand taken from the well. This example is hardly sufficient to sustain so general and sweeping a statement. But let us bring it to the test of experience.

There are many thousand cellars and wells dug every year, there are thousands of places where the drift has been exposed in grading for railroads, hundreds of places where the soil has been brought up from great depths in digging for coal and minerals—and we ask, with what result? In all this country how many new species have been brought to light by these means? We venture to assert not one. Is it true that earth brought up from even a few feet in depth sends up a "ready crop of weeds," for whose appearance we cannot readily account by the aid of winds, birds and water?

We admit that there are some facts connected with the succession of forest trees that seem difficult to explain; but, even if we admit that, in such cases, the seeds of one kind of trees have lain dormant in the soil for the lifetime of another kind, and then have taken their turn in the production of a forest of a different kind, the adoption of that view does not give license to the opinion that these seeds would have retained their vitality for a geological age, if buried hundreds of feet beneath the surface.

Some very absurd stories have been related respecting the vitality of seeds, and once started, these stories seem to pass without a question.

Even Prof. W. is compelled to doubt some of the stories which he brings to the support of his theory; for instance, that of a beautiful *Dahlia* having grown from a *bulb* found in the hands of a mummy 2000 years old. It is also stated that "it is generally believed that wheat is now growing in England which was derived from grains folded in the wrappings of Egyptian mummies, where they must have lain for two or three thousand years." We confess that we fully share the doubts of Prof. Gray on this subject.

We now come to the fourth proposition of Professor W., viz: "The living germs of the diluvial deposits were buried during the glacial period."

The argument in support of this statement is that the fossil plants which have been discovered in the Tertiary deposits show a correspondence of genera, and in some cases of species, with those of the present date. During this Tertiary period the seeds of plants accumulated in the soil; then came the change of climate and destruction of vegetation which attended the glacial period, during which the surface was plowed up by glaciers, and afterward exposed to the commotion of the sea, which overspread the land, burying everything in promiscuous ruin; but yet by this very means storing away the seeds which, when brought to the surface after the lapse of a geological age, are possessed of vitality and able to reclothe the barren earth with verdure and beauty! Who can say that this prolonged vitality of seeds is impossible? Who can say that it possesses the *slightest degree of probability?*

Most cordially do we assent to the following observations of Prof. W: "It must be confessed that the crucial observation is yet to be made. If vegetable germs exist in the drift they can be discovered beforehand; and until they have been actually detected, it is probable that even the convincing facts cited above will fail to secure universal assent to our proposition involving the prolonged vitality of the seeds of preglacial vegetation." It is the misfortune of science that too many plausible theories have been promulgated without first obtaining the crucial experiment.

We pass to the consideration of the fifth proposition: "In proportion as the diluvial surface became exposed, the flora of the preglacial epoch was reproduced." We may readily believe this to have been the case, if the fact be established that "the diluvial deposits were everywhere replete with living germs."

It will be observed that this proposition applies, *not* to the prairie region, but to the older portions of the continent. The former became "a vast inland sea, upon whose bottom gathered the lifeless sediments that were to be the soil of the prairies." When this surface was finally drained, it was left "a naked and lifeless expanse of vegetable slime," containing no vegetable germs, and by its nature preventing the development of any, in the diluvial matter below.

But we hasten to the consideration of the final proposition—"The vegetation which finally appeared on the drained lacustrine areas was extra-limital, and was more likely to be herbaceous than arboreal." The substance of this proposition seems to be that the vegetation which first clothed the prairie region was introduced from beyond its limits, by the three natural agencies of winds, running water and animals; and that because the seeds of trees, as the oak, hickory and walnut, were heavier than the seeds of grasses and herbs, they were not so easily dispersed, and therefore the prairie became covered with herbaceous vegetation exclusively. We do not see that in this proposition any use has been made of the theory which has been so extensively elaborated by Prof. W., unless it be to account for the occurrence of that extra-limital vegetation which formed "a shining ridge of forest trees around the margins of the prairies." Where were these margins? The ancient lake, which finally became the prairie region, reached its arms into Iowa, and into northern Indiana and southwestern Michigan. The margins of this lake, then, were in Iowa on the west, and in Indiana and Michigan on the northeast. The northern and southern boundaries are not directly given, but we may reasonably suppose them to have been as widely separated as those of the west and east. Here, then, was a "naked and lifeless expanse of vegetable slime."

Is this meant for a picture of a lake region rapidly drained? If rapidly drained, a large portion of the lacustrine sediment would have been washed away, exposing, in thousands of places, the diluvial deposits; the living germs with which they were replete would then have been exposed to the genial influences of sun and air, and would have reproduced the ancient vegetation. But no—the vegetation of the prairie region was "extra-limital," and brought in by the agency chiefly "of winds, animals and running waters." We have great faith in these agencies, and believe they are sufficient to account in great measure for the vegetation, not only of the prairie region, but of the continent. In the prairie region the forests principally form belts around the large water-courses. These drainage channels furnished favorable localities for the growth of certain kinds of trees, particularly the Willows and Cottonwoods. These may be called the pioneers of the forest; their seeds are light, and covered with a cottony down, which causes them to be easily carried before the winds for great distances. They would naturally find lodgment and development in advance of many other forest trees with heavier seeds. But having established a line of trees, or of scattered groves, on the margin of a stream, they would be constantly visited by birds and animals, which would gradually introduce the seeds of other forest growths, and thus the boundaries of the forest would be extended. The fruit of the wild cherry and plum, the mulberry, hackberry, black gum, and many other trees, are eagerly eaten by birds, and the pits are voided uninjured for purposes of vegetation.

As the veins of a leaf all converge from the circumference to a common point, so the lines of timber, following the water-courses, converged to the great outlets, leaving many intermediate spaces which would earliest be occupied by the grasses and herbaceous plants. The beginning of these timber lines would naturally be at the points of earliest drainage, *i. e.*, near the sources of the streams; but a line of communication having once been established to the outlet, the seed distribution would also operate *up stream*, whence it comes to pass that some southern species have extended northward in the bottoms of the larger rivers nearly or quite through the extent of the prairie region, as the papaw, the persimmon, and the Kentucky coffee-tree.

We do not offer this as a full solution of the prairie question; probably the annual burnings by the Indians, and other influences not yet understood, operated in the production of these gardens of the West.

One element to be taken into consideration in the discussion of this subject is the peculiar character of prairie vegetation. If it shall appear that there is a class of vegetation which does not occur outside of the prairie region, we must then bring in other influences than those presented by the theory under consideration. We will refer to some of the plants which are usually regarded as of this character, viz: *Ranunclus rhomboideus, Viola delphinifolia, Linum Bootii, Amorpha canescens, Baptisia leucantha, Geum triflorum, Potentilla arguta, Eryngium yuccæfolium, Eulophus Americanus, Solidago Riddellii, Silphium laciniatum, Silphium terebinthaceum, Ambrosia bidentata* and *psilostachya, Helianthus rigidus* and *mollis, Coreopsis palmata, Cacalia tuberosa, Hieracium longipilum, Troximon cuspidatum, Castilleia sessiliflora Lithospermum longiflorum, Asclepias Sullivantii, Platanthera lencophea.*

We present these criticisms on the theory we have been discussing, not in a captious spirit, but under a conviction that the cause of science demands a most rigorous investigation of all scientific theories.

Prof. Winchell, in his "Sketches of Creation," manifests a profound knowledge of geological phenomena, and has woven together those phenomena into a world-history, with such skill and with such an agreeable style as to present all the charm of a romance. As a popular *résumé* of Geology, we believe it will do much good.

In South America the gigantic *Guaduas*, an arborescent grass, attains a height of 50 to 60 feet. It blossoms so very seldom, that in the course of four years Humboldt was able only twice to procure the flowers.

THE OAKS—No. 2.

(Fig. 172.)

Swamp White Oak (*Quercus bicolor*) Willd.

In the June number we gave an account of the White, Bur and Post Oaks. Next in order we may consider the Southern Overcup (*Quercus lyrata*, Mx.) This is a native of the Southern States, from North Carolina to Florida, and west to Louisiana. It grows in swamps, and attains about the same magnitude and height as the Bur Oak of the Western States. Its leaves are long and smooth, with oblong, nearly acute, lobes, expanded above and contracted below. The acorns are nearly round, and are almost entirely covered by the cup.

In this section, also, we may briefly notice several species occurring in California, Oregon and the Rocky Mountains. The California White Oak (*Quercus Hindsii*, Benth.) is a noble tree, having very great resemblance in leaf and general appearance to the White Oak of the Atlantic States, distinguished particularly by the long, pointed acorn, two inches long by two-thirds of an inch thick. It grows, either singly or in open groves, on low mountain slopes, along the streams which course down to the coast. The wood is porous and brittle, in this respect quite unlike its congener of the East.

The Oregon White Oak (*Quercus Garryana*, Doug.) is a large tree, sometimes reaching 100 feet in height. The wood is fine, hard-grained, and very white, strong and durable. Its acorns are sweet and edible, and constitute an important article in the support of the Indians of that region. Several other species of less importance occur in California and New Mexico.

But to return to the Eastern part of the continent, we next come to a consideration of the Chestnut Oaks, which are distinguished from the White Oaks by having their leaves toothed, but not lobed.

Here we have, first, the Swamp White Oak *Quercus bicolor*, Willd., and *Q. Prinus, var. discolor*, Michx.). a figure of which (Fig. 172), and of the next species, we copy from Dr. Brendel's article on Oaks, in the Ill. Agr. Soc. Transactions.

This tree is very widely diffused through the Eastern, Western and Southern States. Its

[Fig. 173]

Chestnut Oak (*Quercus castanea*, Muhl.)

favorite abode is in rich, alluvial lands, often forming a considerable portion of the forests covering the bottom lands of the Western rivers. The leaves vary in outline from obovate to oblong, with large and coarse blunt teeth, or with a wavy, coarsely toothed margin, with a soft, whitish down on the under surface, usually tapering to an acute base, and with a very short stem or petiole. The acorns are usually elevated on a stalk, or peduncle, sometimes an inch long. They are quite large, equaling, at least, those of the Bur Oak (*Q. macrocarpa*, Michx.), with the scales of the cup prominent and sometimes mossy fringed on the border. In low bottom lands it fruits abundantly, and in some of the Western States the acorns are an important article for the fattening of swine, and with other hard fruits of the forest are called *mast*.

The Chestnut Oak (*Quercus castanea*, Muhl., and perhaps also of Willd.) (Fig. 173) next claims our attention.

This tree differs from the preceding in its size, being a much smaller tree; in its favorite situations, which are rough or rocky hills; in its

[Fig. 174.]

Chinquapin Oak (*Quercus prinoides*, Willd.)

leaves, which closely resemble those of the Chestnut; and in the acorns, which are only about half the size. These points will be readily noticed in the accompanying figure (173).

Dr. Gray, and most botanical authors, describe in this group, as a distinct species, a Chestnut Oak under the name of *Quercus Prinus*, L., which is said to be "common southward and scarce northward." We have not yet identified this species in the West. A variety of this species, called

Rock Chestnut Oak (*var. monticola*, Mx.) is also given as occurring in the Eastern States. There has evidently been much confusion in the nomenclature of this group of Oaks. Michaux, indeed, united into one species, *Q. prinus*, L., not only the typical form (which is it?), but as varieties four forms, several of which are now regarded as good species, including those above described, and another which is known as the Chinquapin Oak, or Dwarf Chestnut Oak.

This is made a distinct species by Willdenow under the name *Quercus prinoides*, and it is considered a good species by late botanical authors. It is a shrub of from two to six feet in height, with leaves closely resembling those of the Swamp White Oak (*Q. bicolor*, Willd.), but much smaller, with an abundance of small, sweetish acorns, and is usually found on poor soil. It is common in the Eastern States, and occurs also in Wisconsin and Iowa, but not, so far as we are aware, in Illinois.

We next take up a group of Evergreen Oaks, in which the maturation of the fruit is like the

[Fig. 175.]

Live Oak—(*Quercus virens*, Ait.)

preceding, annual. (Another group of evergreen species comes in the next section.) In Mexico and California are several species of this kind, but on the eastern side of the continent we have only one, the Live Oak (*Q. virens*, Ait.)

This species is confined to the Southern and Southwestern States, being found from the coast of Virginia southward and westward. It has entire or nearly entire leaves, oblong and blunt, almost leathery in thickness, shining on the upper surface and whitish beneath. They are rather small, usually from 4 to 6 inches long. The acorns are oblong and pointed, the smoothish cup enclosing about one-third of the fruit. This species furnishes valuable timber. Michaux and some of the older writers classed this with the biennial fruiting species, but DeCandolle and later authors place it in the annual fruiting section, where, from its sweet acorns and the absence of bristle-pointed leaves, it would naturally seem to fall.

BOTANICAL MISCELLANY.

Classification of Oaks.

Dr. F. Brendel, in the *American Naturalist* of May and June, furnishes a very elaborate article on the history, nomenclature and classification of American Oaks. He goes back to the first mention by a botanical author of an American oak, in 1640, and follows up the history of new discoveries, and of methodical arrangements, down to the latest enumeration of DeCandolle. We make the following extracts, in which we think our readers will be interested:

Andre Michaux explored, from 1785 to 1796, the forests of Eastern North America. He published in 1801 his "Histoire des Chênes de l'Amérique Septèntrionale,' in which, for the first time, is pointed out a character very important to the methodical arrangement of the Oaks—the time of maturation. His arrangement is the following:

I.—The leaves not bristle-pointed; fruit peduncled, annual.
 Under this division he further classifies:
 1. Leaves lobed: *Quercus obtusiloba, macrocarpa, lyrata, alba*.
 2. Leaves toothed: *Q. prinus*, with five varieties, *palustris, monticola, acuminata, pumila* and *tomentosa*.
 3. Leaves entire: *Q. virens;* but the fruits are, according to him, biennial. (This is corrected in his later enumeration.)

II.—Leaves bristle-pointed; fruit sessile, biennial.
 1. Leaves entire: *Q. phellos*, with three varieties, *Q. cinerea, Q. imbricaria, Q. laurifolia.*
 2. Leaves with short lobes: *Q. aquatica, Q. nigra, Q. tinctoria*, with two varieties, and *Q. triloba.*
 2. Leaves deeply lobed: *Q. banisteri, Q. falcata, Q. Catesbœi, Q. coccinea, Q. palustris* and *Q. rubra.*

Persoon, in his "Synopsis Plantarum," 1805, enumerates eighty-five oaks, of which forty-six are American; thirty from the eastern part of North America, two Californ'an, and fourteen Mexican.

In Pursh's "Flora," 1814, are mentioned thirty-four species; all are eastern except *agrifolia*, and comprising all the species of Michaux, with the additions of the younger Michaux and Willdenow. In his arrangement, the ripening of the fruit takes the first place as a diagnostic character; the second, the presence or absence of the bristles of the leaves; third, the form of the leaves. Nuttall, in "Genera of North American Plants," 1818, follows the same disposition, but the number of his species is thirty-two.

Spach, in Vol. XI of his "Histoire Naturelle des Veg. Phanerog." 1842, gave a natural arrangement of the oaks, which is founded on the form and duration of the leaves, the cup, and the ripening.

Endlicher maintained the same disposition and characters, only changing the name of one of the sub-genera, and establishing for it three subdivisions of the sub-genus *Lepidobalanus*, which includes nearly all our American species.

De Candolle adopts the three sub-genera of Endlicher, adding two more, viz: the sub-genus *Androgyne*, formed by the single Californian species, *Q. densiflora*, Hook, which has the flowers of both sexes in an upright spike, male above, female below, the abortive ovules at the apex of the seed; the other new sub-genera is *Pasana*, with south Asiatic species. All the other American species belong to the sub-genus *Lepidobalanus*. The arrangement in the "Prodromus" is thus:

I.—LEPIDOBALANUS.

§ 1. Abortive ovules below; maturation annual.

**Leaves deciduous.*

1, *Quercus lyrata*, Walt.; 2, *Q. macrocarpa*, Michx.; 3, *Q. olivæformis*, Michx.; 4, *Q. bicolor*, Willd.; 5, *Q. prinus*, L. (here he places as varieties *Q. castanea*, Muhl., var. *monticola* and var. *prinoides*); 6, *Q. stellata*, Wg. (which is *Q. obtusiloba*, Michx.; there are three varieties of this species given, one in Florida, *Q. floridana*, Shut., the var. *depressa*, Nutt., on the Upper Missouri, and var. *utahensis*, the only oak between Salt Lake and Sierra Nevada); 7, *Q. alba*, L., with two varieties, *repanda* and *microcarpa*. Then follow five Californian and New Mexican species, which are nearly related to the European *Q. robur*, and of Mexican and Central American species twenty kinds.

**Leaves persistent.*

Of this section one only, *Q. virens*, Ait., belongs to the eastern part of the continent, the others are chiefly Central American.

§ 2. Abortive ovules below; maturation biennial.
The species in this section are all New Mexican.

§ 3. Abortive ovules above; maturation biennial.

**Leaves deciduous.*

The Eastern species in this section are, 1, *Q. falcata*, Michx.; 2, *Q. illicifolia*, Wg.; 3, *Q. rubra*, L.; 4, *Q. palustris*, DuRoi; 5, *Q. Georgiana*, A. Curt.; 6, *Q. coccinea*, Wg.; 7, *Q. Leana*, Nutt.; 8, *Q. phellos*, L.; 9, *Q. imbricaria*, Michx.; 10, *Q. nigra*, L.

**Leaves persistent (evergreen).*

1, *Q. aquatica*, Walt.; 2, *Q. cinerea*, Michx.

De Candolle supposes that of the species now known and described, about two-thirds are provisional, and that when all the species of America and Asia now adopted are as well studied as the European, the "good species" will be reduced to about one hundred; then the American species would scarcely be more than fifty. This is credible when we perceive that the single species, *Q. robur*, as proposed by De Candolle, includes thirty-two varieties, and nearly a hundred synonyms.

The *American Agriculturist* is undoubtedly doing much to form a popular taste for Natural History, by its numerous articles on that subject, rendered doubly attractive and useful by its excellent illustrations. In the June number we find the following:

The Prairie Apple (*Pomme blanche*).

The species of our native plants are very numerous, but among them there are but few which furnish articles of food. Berries and perishable fruits are more or less abundant in their season; but those native products which can be stored up are limited in number, and as articles of food are at best indifferent. Neither in the variety nor in the quality of his food does the savage equal the poorest among the civilized. Acorns and grass-seeds are poor substitutes for corn and wheat; and, among the several more or less edible roots used by the Indians, there is none which approaches the potato in excellence and nutritious quality. A large share of the vegetable food of some of the Western tribes of Indians is the Prairie Apple, or Pomme Blanche, as it was named by the French *voyageurs*. It is the root of a *Psoralea* (*P. esculenta*), which is found from Wisconsin westward to the Rocky Mountains.

The plant grows about a foot high, has leaves with five divisions, and its flowers are clustered in a dense head much resembling a large clover. The flowers are purplish-blue. The root is turnip-shaped, and somewhat farinaceous; and, though it would be considered scarcely edible by us, is gathered in large quantities by the Indians, and stored for the winter.

THE AMERICAN HOLLY.

[Fig. 176.]

The American Holly (*Ilex opaca*, Ait.)

We have lately been shown a twig of the American Holly (*Ilex opaca*, Ait.) which was collected on the banks of the Mississippi near Vicksburg. The leaves are evergreen, thick, and of a lively green color, and about three inches long. In this specimen they are nearly oval in outline, with several short, stiff, prickly teeth scattered on the edge. Close around the stem and among the leaves are five or six dull red berries, about the size of peas.

The Holly is a small tree growing near the seacoast from Maine to Florida; not common, however, to the North. It attains a height of from twenty to forty feet. Our botanical works do not mention the occurrence of the tree so far from the seacoast as the specimen from Vicksburg. Our tree closely resembles the European Holly, but differs in several particulars: the

[Fig. 177.]

The European Holly (*Ilex aquafolium*, L.)

leaves are not so wavy in outline, less glossy, and the berries of a darker color. We have a specimen from Florida, in which the leaves are smaller, obovate or almost wedge form, and with teeth only near the summit.

In an article recently published in the *Journal of Agriculture* on the Holly, the writer, Mr. J. Parish Stelle, assumes that the Holly of the Gulf States and the Mississippi Valley is the *Ilex aquifolium*, L., identical with the European tree, and that it differs from the Holly of the Atlantic coast. This is a question which must be decided by careful observation, and the preparation of good botanical specimens. We commend this work to the attention of our botanical friends in the South.

Sometimes an inch of water falls in a day, or even in a single shower. This is equivalent to about three hundred and sixty hogsheads to the acre.

THE LEAF AS A WORKER—No. 2.

BY DR. J. A. SEWALL, NORMAL, ILL.

But if we regard the leaf only as a drawer of water, a lifter of earthy matter, a carrier of lightning, a gatherer of nourishing gases, a defense against zymotic diseases, we give it an inferior place—it is only a humble, common laborer. Man might invent and apply machinery to pump the water and evaporate it; he can enrich the soil, can put on his roof metallic conductors, and can escape epidemic diseases if he will breathe *pure air*. "Ah! there's the rub!" for he can get pure air only as the leaf prepares it for him. Man can, in a measure, do the work of the leaf, but science has failed to demonstrate a way to do the chemical work that the leaf does.

The leaf is not a common laborer, then; for, though it deigns to do this drudgery, its great field of labor is elsewhere. It is an analytical chemist of the noblest order, and, as such, performs labor that Liebig, and Fresenius, and Regnault, attempted in vain, and such as no chemist can ever perform. Here it is that the leaf asserts its superiority as a worker—becomes a right royal laborer. Here it uses the same re-agents that man is permitted to use, but with which he cannot succeed. And so the leaf looks down upon the great and learned chemist, and regards him as a bungler. Every exhaled breath of man, and of every animal on the face of the globe, is loaded with poison. The product of combustion, whether arising from the cheerful home fire, from the fire-box of the locomotive, from the furnace of the factory, or belching forth in terrible profusion from the yawning crater of the volcano, is pregnant with the same life-destroying agent. Millions of cubic feet of this dread destroyer, one foot of which is sufficient to produce death, is being set free every second of time. It is escaping from your lungs every four seconds. But be not frightened—no harm can come to you; for God has ordained the leaf as his agent to care for you—to disarm this deadly foe of its terrors—to seize upon it, anatomize it, take to itself a part, and give up the remainder as the life-giving air of heaven!

And what is the measure of its force—what is the sum of its acting energies? I can only tell you what is its *equivalent*. I can give you the exact measure of its strength, and at your *longest leisure* you can reduce it to the ordinary standard of mechanical force, and determine the measure in horse-power. How much mechanical labor, can all the men, women and children, all the animals of the earth, and all the locomotives and engines on sea and land perform? The leaf does just as much as all those combined.

We have said nothing of the æsthetics of leaves—of their beauty and variety (we must not forget that all flowers are leaves). There is not a leaf in the whole vegetable kingdom that does not excite emotions of the beautiful, either by its form, color, or odor. There is beauty in the leaves of the solitary palm, and beauty in those of the dense forest, crowded so thick that beneath them the "shadow hardly moves." Beauty in the microscopic moss-cup, as well as in the palm whose leaves expand to thirty feet in circumference—beauty and glory in them all.

Not only, then, does the leaf supply all the material wants of man, but it also ministers to his spiritual nature—reveals the character of God, blesses man, makes him nobler, wiser and better. In autumn, when the cold winds blow and the leaves turn yellow and red, it is the popular belief that the *frost* has colored and killed the leaves, and caused them to fall away. Not so. We mistake here a coincidence for a cause. The time for frost and for falling leaves is the same—one has no relation to the other. There has been no work of violence wrought—no destruction. The leaf has finished its allotted task, it has built up its appointed cycle, stored up the food for its successors, and now its work is done—Ah! well done. No duty has been neglected; it has finished its course; and now it arrays itself in its most gorgeous hues, for its hour of glory has come, and it rests upon the bosom of its mother earth.

May it not teach us here a lesson—a marvelous lesson—how to live and how to die; how a true life is crowned by a triumphant death?

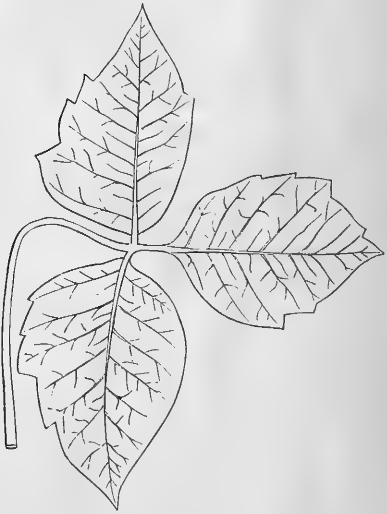
POISON IVY.

(*Rhus toxicodendron*, L.)

I will pluck a leaf with a pair of fire-tongs, at arm's length, press it dry so as to make an exact drawing of it, and write a full account of this venomous plant. I will try to make the whole matter so plain that everybody can detect and avoid the vile thing which is making me so much trouble. These were some of my midnight thoughts, as I feverishly turned in bed while suffering from its effects. Water, saturated with salt, was my only remedy. The poison was followed by two generous crops of boils, about fifty in number, lasting for over two weeks. Now I can only look at the plant with a sort of subdued feeling, as though it were more than a match for me. Look out for *Rhus toxicodendron*, which trails in the sand, or among the bushes, or lurks in the grass like a treacherous serpent! To touch it means a face swollen to blindness, great irritation, itching, and smarting and burning of the parts affected.

Poison Ivy, or Poison Oak, is a humble shrubby vine, with light-green leaves and clusters of greenish flowers looking something like the flowers of the grape vine. The leaves are compound, consisting of three leaflets, the size and shape of which are shown by Figure 178,

[Fig. 178]



Poison Ivy (*Rhus toxicodendron*, L.)

which illustrates the veins of the underside. It belongs to the Sumach family, a group of plants which has rather a bad reputation, on account of several poisonous species it contains.

To some people it is harmless, even when the sap is rubbed on the skin, while others are sure to be affected even by touching the naked stems and buds. I have known instances in which some members of the same family were easily poisoned while others were not at all affected. Why do we not get vaccinated, as it were, and never get poisoned a second time? Do our entomological friends find any insects that can eat the leaves?

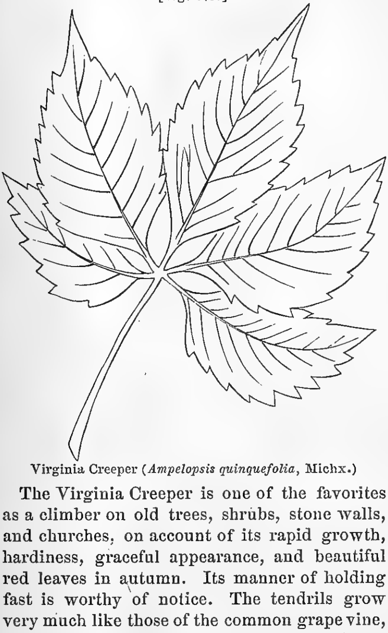
The plant most likely to be mistaken for poison Ivy is—

The Virginia Creeper,

(*Ampelopsis quinquefolia*, Michx.)

Both are woody vines, and more or less ornamental in autumn. The Virginia Creeper belongs to the Grape, or Vine family (*Vitaceæ*), bears blue berries like grapes, and hangs on by tendrils. The Creeper has five leaflets to a leaf, the Ivy three.

[Fig. 179.]



Virginia Creeper (*Ampelopsis quinquefolia*, Michx.)

The Virginia Creeper is one of the favorites as a climber on old trees, shrubs, stone walls, and churches, on account of its rapid growth, hardiness, graceful appearance, and beautiful red leaves in autumn. Its manner of holding fast is worthy of notice. The tendrils grow very much like those of the common grape vine, and hold fast in a similar manner. But it can climb where the grape cannot—up the side of a brick or stone wall, bark of a tree, or siding of a house. This it does by expanding the tips of the tendrils, covering them with a sticky substance—a natural prepared glue. This is held patiently to the place until the glue hardens, when the tendril makes a double twist, and hugs the vine closer to the wall. The tips of the tendrils which take hold of small limbs often make the coil more secure by sticking the end fast to the support. W. J. Beal.

Chicago, May 25, 1870.

Figs grow very abundantly in South Carolina; they ripen twice a year, and compete, when dried and packed, with the foreign imported ones in the home market.

SEA-SIDE CROWFOOT,

(*Ranunculus cymbalaria*, Pursh.)

BY E. M. HALE, M.D., PROF. OF MEDICAL BOTANY, CHICAGO.

[Fig. 180.]

Seaside Crowfoot (*Ranunculus cymbalaria*, Pursh.)

Among all the Ranunculacæ, none are more beautiful than the little "Sea-side Crowfoot.' We present a figure of this little plant, by which it will be seen that it is one of the smallest of the Crowfoot family. It is also one of the most interesting. The plant has a short stem, which sends off long runners from the base that are rooting and leafy at the joints. The leaves are all roundish, mostly heart-shaped at the base, crenate-toothed, rather fleshy, and on long petioles. The flower stalks are leafless, and bear from one to seven or eight flowers. The petals are five to eight, and of a beautiful brilliant yellow. Carpels (pistils) are in oblong heads, very numerous, short-beaked, and striate-veined on the sides.

The flowers usually begin to appear about the first of June. In Chicago, for several years, I have found the first flowers on the 25th and 28th of May, but this year (1870) I found a few on the 20th of May. It has delicate, white, fibrous roots, two or three inches long. The fine slender runners are sometimes several feet in length.

Many of the Ranunculaceæ are used in medicine, having acrid and stimulating properties. This species has but little of these acrid qualities. The root has a very slight pungent taste—a taste peculiar to all of this genus—which the leaves do not possess at all, but are succulent and rather pleasant. The seeds are, however, quite pungent, or "peppery," when chewed. It is not probable, however, that this plant will ever be used in medicine.

The most interesting thing relating to this pretty little plant is its habitat. Prof. Gray says it is found on the sea shore from Maine to New Jersey, and adds that it is also found at the Salt Springs, Salina, New York, to Illinois and westward. The question arises in the mind of the botanist, Why is it found away from the sea shore, if it is a marine plant? The fact of its being found near the Salt Springs in New York would seem to show that it has a liking for saline earth. Why should it be found on the shores of the great Lakes? I do not know that it is found an the shores of Ontario, Erie, Huron or Superior; Foster and Whitney, in their report on the Lake Superior region (Geological), do not enumerate it among the plants found there.

When I came to Chicago, in 1860, I found it growing all over the city, even to Twelfth street on the south, or as near to the river as was possible on account of the population. From the mouth of the Chicago river, its habitat extended on the north, west, and south sides to a distance of two or three miles. Beyond that area it can not be found; at least I have not observed it in other localities.

Why has it selected this locality? If it was once a marine plant, and has become accustomed to inland soils, why is it not found more extensively distributed all over the country? We know that there are several species of plants, supposed to be marine, which have apparently become accustomed to a different soil, and flourish in inland localities. Would it seem too fanciful to suppose the theory taught by some geologists, that the great Lakes, now fresh, were once salt, or that a sea once existed in the same location? If such was the case, we may suppose that, when the change occurred, it was so gradual that the flora on its shores was not subjected to such a sudden transition as to destroy it, but gave it, or a few species of it, sufficient time to become accustomed to its new soil and atmosphere. We must either accept this theory, or another, namely, that the seeds of this species and others have been transported from the ocean, or salt water, to this locality.

I would like to inquire of the readers of this journal, if they have found the *R. Cymbalaria* on the banks of the Mississippi, or on the shores of the smaller lakes of the Northwest; and I hope this brief paper will call out some discussion on the subject broached herein.

[The *R. cymbalaria* occurs on the sandy and muddy banks of many Western rivers, as on the Platte at Denver, and on the west side of the Mountains in Middle Park, and still farther west on the Green river. We do not see that it has any claim to be considered a saline plant.—Ed.]

Corrections.—In an article on "Our Woody Compositæ," in the May number, it was stated that, east of the Mississippi river, we had no woody Compositæ. This statement was based on a hasty review of the Compositæ of the Northern States. Our attention has been called to the fact that in the Southern States there are several shrubby members of the family in question, for instance, several species of *Baccharis*, one species of *Iva*, and a *Borrichia*. We make the correction with pleasure.

In our June number we gave, under the head of "Plants to Name," a list of specimens from Mr. S. A. Forbes, in which we unintentionally did him injustice; as really the larger portion of the specimens were correctly named by him, and were contributions to the cabinet of the editor.

In the Natural Order *Leguminosæ* there are no doubly-pinnate leaves belonging to the sub-order *Papillionaceæ;* but in the sub-orders *Cesalpiniæ* and *Mimosæ* the pinnate form of leaf is found. No pinnate leaves are known in *Gentianaceæ* and *Rubiaceæ*. Simple and compound leaves frequently occur, not only in the same family, but in the same genus.

"It is singular that no mention of the beautiful arborescent ferns is to be found in the classic authors of antiquity; while reference is made to Bamboos, to the Banyan, or Indian Fig tree, and to Palms. The first mention of arborescent ferns is by Oviedo, a Spanish writer, in 1535, in describing the vegetation of Hayti. 'Among ferns,' says this traveler, 'there are some which I class with trees, because they are as thick and high as pine trees. They mostly grow among the mountains, and where there is much water.' Between the tropics, on the declivities of the Cordilleras, the true region of arborescent ferns lies between about 3,200 and 5,350 feet above the level of the sea. They seldom descend lower toward the plains than 1,280 feet. The mean temperature of this region is between 64° and 70° Fahr."

NEW PLANTS.

We have received from Mr. S. A. Forbes specimens of two plants, which, if not really new species, are so remarkable in their appearance, and so different from the ordinary forms of any species to which they are related, that they certainly merit description at least as marked varieties. They are a *Saxifraga* and a *Heuchera*, both growing on shaded cliffs near Makanda and Cobden, Southern Illinois. The Saxifraga in general appearance is intermediate between *Saxifraga virginiensis*, Mx., and *S. pennsylvanica*, L., or, as Dr. Gray suggests, between *S. erosa*, Pursh., and *S. virginiensis*, Mx., approaching nearest to the last-named. It is an herbaceous plant, presenting at the ground a cluster of half a dozen soft, hairy leaves, four to eight inches long, thin, lanceolate, and toothed on the margin, or sometimes nearly entire. From the root rises a flower-stalk two to three feet high, without leaves, but with a few slender bracts at the base of the branches. The upper half or third of the stalk divides into six or eight branches, forming a pretty large open panicle; the main branches again subdivide into very slender pedicels, with small flowers having the general characters of the genus to which it belongs. The stem or scape is clothed with rather sticky or glandular hairs. We append a *botanical* description and dedicate the species to the enthusiastic young naturalist who first detected it:

SAXIFRAGA FORBESII (n. sp).—Leaves lanceolate, or elliptical-oblong, rather thin and pointed, tapering into a short margined petiole, pubescent, especially on the margin, veins and petiole, crenate or repand dentate, 4—8 inches long. Scape leafless, slender, viscid pubescent, two to three feet high; upper third or half forming an ample, loose and open panicle of 6—8 branches. Flowers small, in cymose clusters at the extremities of the branches; pedicels slender, bracts linear; sepals obtuse *reflexed*, shorter than the *linear* (two lines long) white petals; filaments slender, nearly equaling the petals; pods two, small, slightly united below, divergent at the summit. Shaded cliffs, Southern Illinois.

The plant differs from the ordinary form of *S. Virginiensis*, Mx., in its much larger size, in its larger and differently shaped leaves, in its more diffuse panicle, more slender pedicels, *smaller* flower, *smaller*, *linear* petals, and *smaller*, more *pointed* and *reflexed* pods.

Of the other plant mentioned, the Heuchera, we have not received sufficiently mature and perfect specimens to give it a complete description, and we therefore will refer to it at a future time.

ANSWERS TO CORRESPONDENTS.

Plants Named—*Samuel Thompson, M. D., Albion, Ills.*—The specimen you send is the Goat's Beard (*Spirea aruncus*, L.), one of the few diœcious plants of the Order Rosaceæ. It is not infrequent in rocky woods in Southern Illinois.

Jonathan Periam, Chatsworth, Ills.—Your plant is the Buffalo Clover (*Trifolium reflexum*, L.); as Dr. Morse says, it is practically of no value—too stalky, and foliage too scanty.

Arthur Bryant, Princeton, Ills.—No. 1 "is the Red Ash (*Fraximus pubescens*) common in the northern and other sections of this State?" We have met with it frequently in Northern Illinois, near Elgin and Chicago, also near Peoria and Springfield. The Green Ash (*F. viridis*, Michx.) is of frequent occurrence in the same region, and still more common in the bottom lands of the Mississippi river, and some forms of these species approach closely to each other, and are not easily distinguished 2. "In what part of the State is the Red Maple most common? All the soft Maples for miles around here produce apetatous flowers, and the broad-winged greenish seeds of *Acu dascycarpum*. I have procured what *was called* the Red Maple from Ellwanger & Barry, of Rochester, and from Phœnix, of Bloomington, but they were in no respect different from those growing here." The *true* Red Maple occurs in considerable abundance on low rich river borders in Southern Illinois. We doubt if, in Illinois, it extends much north of the Ohio and Mississippi Railroad. We have noticed that the Soft Maple shade trees of Bloomington are nearly all the Silver-leaved Maple (*A. dascycarpum*). 3. "Another matter about which I am puzzled relates to the *Populus angulata* and *P. monilifera*. The two species are usually confounded under the name of Cottonwood, and certainly the botanical difference is not very strongly marked. Cottonwood trees are usually difficult to split, and when sawed into lumber, warp and twist in every possible direction. Yet some of them, which have *heart-wood* of a *yellowish color*, like that of the tulip tree, can be split into rails and shingles, and do not warp when sawed into lumber. Are these the *P. angulata*, or a variety common to both species?" We have observed with great care the Cottonwoods in all parts of the State, and have failed to establish distinguishing marks for the two species referred to above, and have concluded that there was really but one species. We know some thorough Botanists in the West who coincide in this opinion. The distinction with respect to the wood, mentioned by Mr. Bryant, *may* furnish a clue by which to unravel the difficulty, and we hope that the trees which present these *wood-differences* may be carefully observed, so that if any distinctive botanical characters exist they may be noted and recorded.

Miss Mary Murtfeldt, Kirkwood, Mo.—No. 1, *Scirpus lineatus*, Michx., a coarse sedge with graceful drooping brown spikes. No. 2 is the Hair-grass (*Agrostis scabra*, Willd.) very common on damp clayey soils. When old the culms break off and are sometimes thrown into heaps against fences, &c. No. 3 is the common Rush-grass (*Juncus tenuis*, Willd.), *too common* in many places. No. 4 is Melic-grass (*Melica mutica*, Walt.), a tall and handsome grass growing in thickets and in low, rich ground. No. 5 is a sedge, a species of the very large genus *Carex*, and a form of *Carex triceps*, the Three-headed Carex. No. 6 is the purple flowered Milkweed (*Asclepias purpurascens*, L.)

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Entomological Department.

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THE ONWARD MARCH OF THE COLORADO POTATO BEETLE.

A WORD TO OUR CANADIAN NEIGHBORS.

Last July, while spending a few days in Ontario, we ascertained that this most destructive insect had just invaded the Dominion at two different points, namely, near Point Edward, at the extreme south of Lake Huron, and opposite Detroit, near Windsor, at the southwestern corner of Lake St. Clair. These are precisely the two points at which we should naturally expect to first meet with it on the Canadian border; for all such beetles as fly into either of the lakes from the Michigan side would naturally be drifted to these points. As we know from experience, many insects that are either quite rare, or entirely unknown, on the western side of Lake Michigan are frequently washed up along the Lake shore at Chicago; and these are so often alive and in good condition, and so often in great numbers, that the Lake shore is considered excellent collecting ground by entomologists. In like manner grasshoppers are often washed up on the shores of Salt Lake, in Utah, in such countless numbers that the stench from their decomposing bodies pollutes the atmosphere for miles around. We have not the least doubt, therefore, in view of these facts, that the Colorado Potato Beetle could survive a sufficient length of time to be drifted alive to Point Edward, if driven into Lake Huron anywhere within twenty or thirty miles of that place, or if beaten down anywhere within the same distance while attempting to cross the lake.

How truly is Mr. Walsh's prophecy being fulfilled, that the northern columns of this great army would spread far more rapidly than the lagging southern columns.*

*Practical Entomologist, I, p. 14.

Now, what will our Canadian brethren do? Will they stand by and listlessly see this pernicious insect spread over their territory like a devouring flame, as it has done over the Western and Central States; or will they make some determined and united effort to prevent such a catastrophe? Of one thing our friends across the border may rest assured—they have not here a sham and braggart Fenian army to deal with, but an army which knows no retreat, and whose members, though of small and insignificant stature, will fully make up in number what they lack in size.

When we calculate the immense loss, amounting to millions of dollars, which this insect has cost the Western States during the past nine or ten years—when we contrast the healthful and thrifty aspect of the potato fields in Ontario and in those States to which this potato plague has not yet spread, with the sickly, denuded, or Paris-green-besmeared fields at home—but above all when we reflect that, nothing preventing, it will infest the whole of Ontario within, perhaps, the next two, and at farthest within the next three, years—we feel that it is high time to make some effort to prevent its onward march through Ontario, if ever such an effort is to be made. The warnings and instructions given by the agricultural press, and through our own columns, will avail but little, as they reach the few only. It may be, and doubtless is, true that successful culture, as our country becomes more thickly settled, will be confined to the intelligent and well-informed; yet the fact nevertheless remains, that the masses will do nothing to ward off an evil until they are forced to it from necessity. The plodding, non-reading farmer will take no notice of the few bugs he first sees in his potato field, because they do him no material injury; but when the bugs have increased so as to make it a question of "potatoes or no potatoes" with him, then his energies will be aroused. But alas! his best efforts, at this time, often prove unavailing, and he has to spend days to accomplish that which a few minutes would have accomplished before. We therefore fully expect to see this great army of bugs continue its eastward march without hindrance, unless other preventive measures are taken than those already employed. A standing premium offered by the Minister of Agriculture, Mr. Carding, for a given number of beetles, or for the greatest number collected and killed in one season, or for the cleanest and best field of potatoes, of a given number of acres, within the infested districts along the eastern shores of the lakes mentioned and those of the St. Clair river; might, and undoubtedly would, be the best means of stamping it out, and of keeping it out of the Dominion.

No doubt that, in suggesting any expenditure of money for such purposes, our Canadian brethren will deem us over-enthusiastic about "small things," and over-anxious for their welfare. Well, be that as it may, we don't forget that there is considerable of Uncle Sam's territory beyond Niagara. It is a mere matter of dollars and cents, and we venture to say that, when once this insect shall have spread over Ontario, a million dollars would be freely spent to accomplish that which will then be almost impossible, and which a very few thousands would effectually accomplish now—namely, its extermination from the Dominion.

An excellent chance is now afforded in Ontario —almost surrounded as it is by lakes—to keep this destructive enemy at bay. In the summer of 1869, reports of this insect's ravages, and of its progress eastward, came thick from Wisconsin and Indiana; but no organized effort was made to check it, and indeed there was very little chance of doing so. It is now fast spreading through Ohio; and, according to Dr. Trimble of New Jersey, has already reached Pennsylvania. Uncle Sam can not well prevent its onward spread around the southern shore of Lake Erie, through Pennsylvania and eastward; but, if it can be effectually resisted between Point Edward and the Detroit river, there will be little difficulty in preventing its crossing at Niagara. A victory would indeed be gained if, by intelligent effort, this grievous pest could be kept out of Upper Canada, while it is devastating the potato fields on all sides in the States; and Minister Carding would add to his well-deserved popularity by making the effort, whether it succeeds or not.

PARIS GREEN AS A REMEDY.

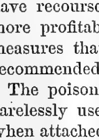
While on this subject it may be well to say a few words about the use of Paris green. This substance has now become THE remedy for the Colorado Potato Beetle, and it is the best yet discovered. Having thoroughly tested it ourselves, and having seen it extensively used, we can freely say that, when applied judiciously, it is efficient and harmless. If used pure and too abundantly, it will kill the vines as effectually as would the bugs, for it is nothing but arsenite of copper (often called "Scheele's green" by druggists), and contains a varied proportion of arsenious acid, according to its quality—often as much as 59 per cent., according to Brande & Taylor. But when used with six to twelve parts, either of flour, ashes, plaster or slacked lime, it causes no serious injury to the foliage, and just as effectually kills the bugs. The varied success attending its use, as reported through our many agricultural papers, must be attributed to the difference in the quality of the drug.

We hear many fears expressed that this poison may be washed into the soil, absorbed by the rootlets of the plant, and thus poison the tubers; but persons who entertain such fears forget that they themselves often apply to the ground, as nourishment for the vines, either animal, vegetable or mineral substances that are nauseous, or even poisonous to us. Animal and vegetable substances, of whatsoever nature, must be essentially changed in character and rendered harmless before they can be converted into healthy tubers, and a mineral poison could only do harm by being taken with the potatoes to the table. That any substance, sprinkled either on the vines or on the ground, would ever accompany to the table a vegetable which develops underground, and which is always well cooked before use, is rendered highly improbable. There can be no danger in the use of sound tubers. But the wise and well-informed cultivator will seldom need to have recourse to Paris green, as he will find it more profitable to use the different preventive measures that have from time to time been recommended in these columns.

The poison may do harm, however, by being carelessly used, and it is most safely applied when attached to the end of a stick several feet long, and should not be used where children are likely to play.

NATURAL CHECKS INCREASING.

[Fig. 181.]



Colors—Yellowish-brown and dark-blue.

In many parts of the West this insect is being kept in due check by its cannibal and parasitic enemies, which are still increasing. Thus we learn from many sources, that in Iowa and Kansas it is not nearly so injurious as it formerly was, while in some parts of Illinois and Missouri it has also become less troublesome. Last year Mr. T. Glover published the fact that the Great Lebia (*Lebia grandis*, Hentz, Fig.

181) was found devouring its larvæ,* and though hitherto considered rare this Lebia has suddenly fallen upon it the present year in many parts of Missouri. During a recent trip along the Missouri Bottom we found this cannibal very abundant in some potato fields belonging to Mr. Wm. Coleman, where it was actively engaged in destroying both the eggs and larvæ of the Potato Beetles. The head, thorax and legs of this cannibal are yellowish-brown, in high contrast with its dark-blue wing-covers.

This makes fourteen conspicuous enemies of our Colorado Potato Beetle which we have figured, and a dozen more, mostly of small size and inconspicuous markings, might easily be added to the list. Moreover, chickens have learned to relish the eggs, and have even acquired a taste for the young larvæ. So we need not wonder that the army is being decimated in those States first invaded by it.

BOGUS EXPERIMENTS.

It was recently reported to us that a neighbor had succeeded in driving away all his Potato bugs by strewing Elder branches among the vines. We went to examine the field, and found our friend enthusiastic over his discovery; and indeed, though the vines were nearly devoured, there were but a few full grown larvæ to be found. But, as he could not tell us what had become of the "slugs," we undertook to show him where they had gone, and after digging a few moments with a trowel, unearthed dozens of them, the majority in the pupa, but a few yet in the larva state. Our neighbor had, in fact, been misled by appearances, for want of better knowledge of his enemy. The larvæ as they acquired their growth suddenly became so destructive, that to save his vines he was obliged to try some means of killing them, and as an experiment he tried the Elder. The larvæ were just ready to disappear of their own accord, and as the great bulk of them did really disappear in two or three days after the application, the apparently logical inference was made that they had been driven away by the smell of the Elder.

How many of the published remedies that flood the country owe their origin to just such defective proof! The sun-scorching remedy, which consists of knocking the bugs off the vines on to the heated ground between the rows, and which has been so often recommended the present year, partakes a good deal of this character; for it can only be of benefit in a very dry season, and at a time of year when the bugs have done most of their damage. A goodly proportion of the larvæ that are thus knocked off will always manage to burrow into the ground and transform, or to get back upon the vines; and

THE TRUE REMEDY

consists in preventing them from becoming numerous so late in the season. Watch for the beetles in early spring, when the vines are just peeping out of the ground. Ensnare as many of them as you can before they get a chance to pair, by making a few small heaps of potatoes in the field planted: to these the beetles will be attracted for food, and you can easily kill them in the morning. Keep an eagle eye for the eggs which are first deposited. Cultivate well, by frequently stirring the soil. Surround your fields on the outside by rows of such tender-leaved varieties as the Mercer, Shaker Russet and Early Goodrich; but, above all, isolate your potato field as much as possible, either by using land surrounded with timber, or by planting in the centre of a corn field. Carry out these suggestions thoroughly and you will not have much use for Paris green, and still less for the scorching remedy.

* Dept. of Agr. Rep. 1868, p. 81.

[From the Missouri Entomological Report for 1869.]

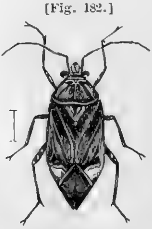
THE TARNISHED PLANT-BUG.

(*Capsus oblineatus*, Say.*)

[HETEROPTERA CAPSIDÆ.]

Quite early last spring while entomologizing in Southern Illinois, I spent a day with Mr. E. J. Ayres, of Villa Ridge, and was surprised to learn that he had become quite discouraged in his efforts to grow young pear trees, on account of the injuries of a certain bug, which, upon examination, I found to be the Tarnished Plant-bug, represented enlarged at Figure 182, the hair line at its side showing the natural size. The family to which this bug belongs is the next in a natural arrangement to that which includes the notorious Chinch-bug, and the insect is, like that species, a veritable bug, and obtains its food by *sucking* and not *biting*. The *Capsus* family is a very large one, containing numerous species in this country, but among them, none but the species under consideration have thrust themselves upon public notice by their evil doings.

[Fig. 182.]



* This bug was originally described by Beauvois as *Coreus lineolaris*, but, according to Mr. Uhler, that author names it *linearis* under his plate. It was subsequently described as *Capsus oblineatus*, Say. Harris, in speaking of it, refers it to the genus *Phytocoris*, and popularly calls it the "Little-lined Plant-bug." It in reality belongs to Fieber's genus *Lygus*. As Say's description is the only one I have access to, I have retained the name he gave it as being eminently appropriate.

The Tarnished Plant-bug is a very general feeder, attacking very many kinds of herbaceous plants, such as dahlias, asters, marigolds, balsams, cabbages, potatoes, turnips, etc.; and several trees, such as apple, pear, plum, quince, and cherry. Its puncture seems to have a peculiarly poisonous effect, on which account, and from its great numbers, it often proves a really formidable foe. It is especially hard on young pear and quince trees, causing the tender leaves and the young shoots and twigs to turn black as though they had been burned by fire. On old trees it is not so common, though it frequently congregates on such as are in bearing, and causes the young fruit to wither and drop. I have passed through potato-fields along the Iron Mountain Railroad in May, and found almost every stalk blighted and black from the thrusts of its poisonous beak, and it is not at all surprising that this bug was some years ago actually accused of being the cause of the dreaded potato-rot.

This Bug is a very variable species, the males being generally much darker than the females. The more common color of the dried cabinet specimens is a dirty yellow, variegated as in the figure with black and dark brown, and one of the most characteristic marks is a yellow V, sometimes looking more like a Y, or indicated by three simple dots, on the scutel (the little triangular piece on the middle of the back, behind the thorax). The color of the living specimens is much fresher, and frequently inclines to olive-green. The thorax, which is finely punctured, is always narrowly bordered and divided down the middle with yellow, and each of the divisions contains two broader longitudinal yellow lines, very frequently obsolete behind. The thighs always have two dark bands or rings near their tips.

As soon as vegetation starts in the spring, the matured bugs, which winter over in all manner of sheltered places, may be seen collecting on the various plants which have been mentioned. Early in the morning they may be found buried between the expanding leaves, and at this time they are sluggish, and may be shaken down and destroyed; but as the sun gets warmer, they become more active, and when approached, dodge from one side of the plant to the other, or else take wing and fly away. They deposit their eggs and breed on the plants, and the young and old bugs together may be noticed through most of the summer months. The young bugs are perfectly green, but in other respects do not differ from their parents except in lacking wings. they hide between the flower-petals, stems and leaves of different plants, and are not easily detected. Late in the fall, none but full grown and winged bugs are to be met with, but whether one or two generations are produced during the season I have not fully ascertained, though in all probability there are two.

Remedies.—In the great majority of cases, we are enabled to counteract the injurious work of noxious insects the moment we thoroughly comprehend their habits and peculiarities. But there are a few which almost defy our efforts. The Tarnished Plant-bug belongs to this last class, for we are almost powerless before it, from the fact that it breeds and abounds on such a great variety of plants and weeds, and that it flies so readily from one to the other. Its flight is, however, limited, and there can be no better prophylactic treatment than clean culture; for the principal damage is occasioned by the old bugs when they leave their winter quarters and congregate on the tender buds and leaves of young fruit stock; and the fewer weeds there are to nourish them during the summer and protect them during the winter, the fewer bugs there will be. The small birds must also be encouraged. Applications of air-slacked lime and sulphur have been recommended to keep them off but if any application of this kind is used, I incline to think that, to be effectual, it must be of a fluid nature; and should recommend strong tobacco-water, quassia-water, vinegar, and cresylic soap. Some persons who have used the last compound have complained that it injures the plants, and every one using it should bear in mind what was stated in the preface to my First Report, namely, that the pure acid, no matter how much diluted with water, will separate when sprinkled, and burn holes in, and discolor plant texture; while if properly used as a saponaceous wash it will have no such injurious effect. It must likewise be borne in mind, that the so-called "plant-protector," which is a soap made of the same acid, will bear very much diluting (say one part of the soap to fifty or even one hundred parts of water), and that it will injure tender leaved plants if used too strong. I have noticed that the bugs are extremely fond of congregating upon the bright yellow flowers of the Cabbage, which, as every one knows, blooms very early in the season; and it would be advisable for persons who have been seriously troubled with this bug, and who live in a sufficiently southern latitude where the plant will not winter-kill, to let a patch of cabbages run wild and go to seed in some remote corner of the farm, in order that the bugs may be attracted thither and more readily destroyed than when scattered over a larger area.

[This insect has been very injurious the present year, and by request we give the above account of it. Mr. J. P. Jones, of Keytesville, Chariton county, Mo., complained bitterly to us this spring of its injuries to pear and apple trees in his section; and later in the season we found our friend H. D. Emery, of Chicago, almost baffled by its injurious punctures in his efforts to raise late-planted cucumbers. Mr. D. B. Wier, of Lacon, Ills., considers that it has damaged his crops to the amount of $1,000; and the *ad interim* committee, which lately visited his orchards, report but little fruit on the pear trees on account of its having poisoned and killed the blossom buds. No doubt the extreme dry weather has had much to do with the increase of these pests. Mr. Ayres tried many applications of different kinds this spring to ward them off, but even some cresylic soap, which we sent him for that express purpose, proved ineffectual, as the following experience will show. He writes, April 12,'70:

I first tried it according to directions—one pound of the soap to ten gallons of water—and it was impossible to kill the bugs with it except by drowning; and they would swim in it an unaccountably long time before they would die. I then doubled the strength, using one pound of the soap to five gallons of water. After immersing one of them in this twice, he would get dry and fly away; but by keeping him wet with it for ten minutes, it would finally kill him. I am inclined to believe that it will not kill insects or keep them off the trees, unless made strong enough to kill the trees also. I thoroughly saturated several rows of trees with it at the strength above stated, and three hours afterward found the bugs as thick as ever, and sucking away at the buds and leaves as if nothing had happened.

Not discouraged by this want of success, Mr. A. afterwards went over all his pear trees, about 2,000 in number, with a basin of soap-suds early in the morning, and shaking each branch, caused the bugs to fall into the water. It took about three hours' time of three men, and by commencing early they were enabled to get through before it got warm enough for the bugs to become active. After pursuing this course for three successive mornings, during which time many thousands were killed, he had the satisfaction of seeing his trees unmolested, and thus saved. From the fact that these bugs suck the sap from, and do not masticate the plant, we have found the poisonous applications which are so effectual in killing many other insects of no avail here; and there is no better way of killing them at present known than by shaking them off early in the morning. It will also be well to bear in mind that, as they winter mostly in the woods, they are at first found most numerous on the outside of our fields and orchards.]

OSAGE ORANGE FOR THE MULBERRY SILK-WORM.

Utah County, Utah.—Having been engaged in silk culture for three years past, I take the liberty of submitting to you a report of what I have done.

In 1867 the Hon. Albert K. Thurber, of this place, on his return from a visit to London, England, presented me with a few silk-worm eggs of the old French variety. They made sixteen cocoons, producing three female moths. The following year I raised five hundred worms, but not having sufficient mulberry leaves to feed them, I fed part of them on Osage orange; they ate it with avidity, all did well, and made cocoons of good size and color. Last season (1869) I fed five thousand worms on Osage orange, and they made five thousand cocoons. This season I am feeding ten thousand worms on Osage orange, and they are doing well. I would here remark that I have never found a diseased worm since I commenced raising silk.

I have fed a portion of my worms each season on mulberry and a portion on Osage orange, and those fed on the latter have thrived and done as well as those fed on the former. I do not suppose Osage orange is preferable to mulberry to feed silk-worms, but it may be of importance to some to know that they will do well upon it. I have fed worms on the two kinds of feed in close proximity, and have known them to leave the mulberry and go to the Osage orange. The dryness of our climate and the absence of thunder storms during the feeding season render Utah particularly adapted to the raising of silk, and perhaps may be more favorable for feeding Osage orange than a moist climate.

Not having sufficient knowledge of the quality of silk to test it, I sent some cocoons to Mr. Muller, of Nevada City, California, to be reeled and tested, and he reports that the silk is, to all appearances, strong and of excellent quality. I intend to make a business of silk culture as fast as circumstances will permit.

[Professor Glover, of this Department, four years since fed the silk-worm (Bombyx mori) with the Osage orange with success corresponding with the above experiment.]—*Monthly Rep. Dept. Agriculture for May and June.*

[When facts of such vital importance as these are published, they lose the greater part of their significance by having no signature. No one can rely on statements of this character when given in such a mythical manner. Five thousand cocoons from five thousand worms is something so unusual and unprecedented, that, under the circumstances, one is warranted in discrediting the statement. Prof. Glover, it seems to us, would have given weight to the above item by attaching the date and the writer's name. We thoroughly experimented with Osage orange this summer, but could not succeed in making any worms spin up on it, though some few were fed into the last stage.—Ed.]

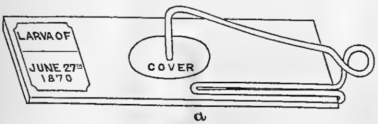
☞ The Colorado Potato Beetle is said to be doing more damage than ever in Minnesota.

HOW TO COLLECT AND STUDY INSECTS—No. 5.

BY F. G. SANBORN, BOSTON, MASS.

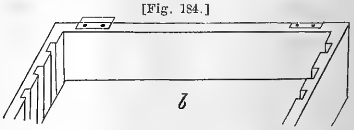
While speaking of the microscope and its uses in studying living insects, I should mention a method of preparing specimens and fragments illustrating the structure or anatomy of these minute beings, so that they may be preserved indefinitely for future use. The ordinary size of a "slide" for the microscope is, as I previously said, three inches in length by one in breadth. The slide should be cut from clear and rather thin glass, free from flaws and air-bubbles, and a few dozen should be kept constantly on hand; they can be easily and cheaply got out by any glazier from his waste slips. If the student wishes to have them finely finished, he can grind the edges smooth upon an emery wheel, a common grindstone, or even upon a flat surface with emery powder and water, at the expense of a little more time and labor. The "covers" will cost him rather more care, as the exceedingly thin glass which is prepared for this purpose is not to be procured except in large cities, where an ounce of circular covers of various sizes generally costs about three dollars. The thinnest glass he can procure will answer for many objects if clear; and even mica, which separates readily into thin plates, and can be readily cut with scissors, serves a very useful purpose, although liable to injury from scratches. The covers need not be round; square or oblong ones are just as good. Cut on an average one-half inch square; few will be required larger, and the majority of specimens will be covered by a one-quarter inch cover. Having a supply of these ready for use, obtain a vial of fir or "Canada" balsam, thin it with chloroform and keep tightly corked. Whenever a small insect, a mite, a gnat, or a young larva, just from the egg, is to be preserved, place it upon the centre of a clean glass slide, let a drop of the balsam fall upon it, and apply the cover. A little experience will enable one to avoid "air-bubbles" and such inconveniences, and show how long the preparation requires to dry and harden, as well as what weight to apply to the cover. English operators use a very effective and simple contrivance

[Fig. 183.]



of wire as in Figure 183, and easily made of different powers of compression suitable to the object. The specimens thus prepared should be kept in boxes lined with grooved slips of wood as in Figure 184, having the grooves op-

[Fig. 184.]



posite, and of such depth and distance apart as to keep the slides separate and safe from breakage. The slides may be numbered or labelled on the glass with a diamond, or bit of hard stone, such as a quartz crystal; or have paper "adhesive tags" pasted on one end, as in our sketch, according to the taste and skill of the student. To return to our collecting. Let us follow the course of this old stone wall, from which have fallen at various times numbers of loose rocks; under many of these will be found forms of life to repay a careful search. But here on the very top of the wall is a crawling thing which we drop into our vial of alcohol with some little repugnance at the touch. "An Earwig?" Not precisely, but sometimes improperly so called. It is not even a true insect, but belongs to the Centipede family of articulated or jointed animals. As you will see, it has too many feet for an insect, or even the larva of an insect. Some naturalists would by a careless use of terms consider it an insect, but we prefer, in accordance with the laws of priority, to confine that title to the true three-jointed articulates which have in the adult condition six legs only. This, as you see, has many joints or segments, and numerous feet, although full grown. The Class to which it pertains is called *Myriapoda*, or many-footed animals, from this *feat*-ure (no pun intended) of its structure; and this species, *Lithobius americanus*, or the American dweller under stones, is very much unlike the true Earwig, *Forficula*, in everything but color, and is very abundant throughout the United States in damp localities beneath stones and logs. In fact, we should not have seen this specimen so high above the ground were it not for the moist condition of the lichen-covered wall after the recent shower. Here are others of the same kind beneath this stone, and a coiled *Myriapoda* looking like a small shell, closely related to the preceding, but very cylindrical and with a much harder covering; as we disturb it, and it endeavors to make its escape, you perceive that its feet are still more numerous than those of *Lithobius*, and move with a very beautiful continuous undulating motion along the sides, reminding one of ripples passing along the sides of a boat.

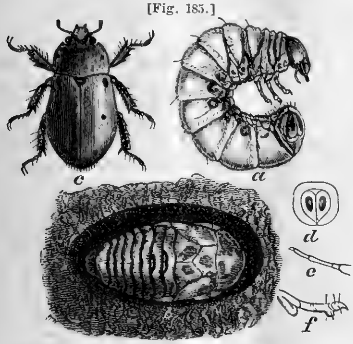
Its name is *Iulus*, and from its form and hardness it is known in some sections of our country as the "wire-worm." The true "wire-worms," baptized long before, however, are the larvæ of the Snapping-beetles, or Elaters. This *Iulus* will preserve well in alcohol.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 11.

The Spotted Pelidnota.

(*Pelidnota punctata*, Linnæus.)

[Fig. 185.]



Colors—(*a*) glassy-white; (*b*) yellowish; (*c*) clay-yellow with black spots.

This is the largest and most conspicuous beetle that attacks the foliage of the Grape-vine, and in the beetle state it seems to subsist entirely on the leaves of this plant, and of the closely allied Virginia Creeper. Though some years it becomes so abundant as to badly riddle the foliage of our vineyards, yet such instances are exceptional; and it usually occurs in such small numbers, and is so large and clumsy, that it can not be considered a very redoubtable enemy.

Its larva has, for a number of years, been known to feed on the decaying roots of different trees, but has never, so far as we are aware, been described, for which reason we append below a description of it. It is a large clumsy grub (Fig. 185, *a*) bearing a close resemblance to the common White Grub of our meadows, and differs from that species principally in being less wrinkled, and in having the chitinous covering (or skin, so-called) more polished and of a purer white color, and in the distinct heart-shaped swelling above the anus (Fig. 185, *d*). Towards the latter part of June we have found this larva in abundance, in company with the pupa (Fig. 185, *b*), in rotten stumps and roots of the Pear. In preparing for the pupa state, the larva forms a rather unsubstantial cocoon of its own excrement, mixed with the surrounding wood. The pupa state lasts but from eight to ten days, and the beetle (Fig. 185, *c*) is found on our vines during the months of July, August and September. It is not yet known how long a time is required for the development of the larva, but from analogy we may infer that the insect lives in that state upwards of three years.

This beetle was named about a century ago by Linnæus, who met with a specimen in the magnificent collection of shells and insects belonging to Queen Louise Ulrica of Sweden. It occurs throughout the States and Upper Canada; and is even met with in the West Indies. It flies and feeds by day. The wing-covers are of a slightly metallic clay-yellow color, with three distinct black spots on each, and the wings themselves are dark-brown inclining to black; the thorax is usually a little darker than the wing-covers, with one spot each side; the abdomen beneath, and legs, are of a bronzed-green. It is easily kept in check by hand-picking.

PELIDNOTA PUNCTATA, Linn.—*Larva* (Fig. 185, *a*)—Length 2 inches; clumsy, moving on the side. *Head*, bright chestnut-brown, smooth, rounded, with a short, impressed, longitudinal line on the top, and three shallow impressions in front; epistoma trapezoidal and darker; labrum rough, irregularly punctate, and beset on the margin with a few stiff rufous hairs; antennæ (Fig. 185, *e*) as long as epistoma and labrum together, 4-jointed exclusive of bulbus or tubercle in which they are inserted; joints cylindrical, proportioned in length as 2, 6, 4, 1, the terminal joint being often a mere bud; mandibles strong and black, with three denticulations at tip, and a very slight tooth at inner basal portion; maxillæ brown and subcylindrical on outside, angulated on inside, bearing two lobes, each terminating in an inwardly curved coriaceous tooth, and each furnished on their inner narrow edge with stiff bristles, the outside one arising close by base of palpus, the inside one extending lower down, and recalling, by its form, the terminal joint of the front leg of a scorpion; maxillary palpi 4-jointed, joints cylindrical, short, very gradually longer and longer from 1 to 4, the terminal joint more pointed and narrower than the others; labium quadrangular, labial palpi 2-jointed, the palpigerous piece strongly beset with bristles. *Body*, smooth with but a few wrinkles on thorax; polished translucent white, with faint bluish marblings on all but thoracic joints, which are slightly narrower than the rest; a narrow vesicular dorsal line, and a very slight yellowish horny plate in a depression on joint 1; a very slight pubescence observable, and a transverse tergal row of sparse but tolerably long hairs on posterior part of each joint; more dense and conspicuous hairs on lower sides of anal joint, which joint is short, cut off squarely, with a heart-shaped swelling (Fig. 185, *d*) sunk into a circular depression, each lobe of the heart with a darker oval coriaceous elevation; spiracles sub-elliptical, dark chestnut-brown, placed on a prominent swelling, the lateral openings *all* facing the head, the 1st on joint 1, the rest on joints 4, 5, 6, 7, 8, 9, 10 and 11, gradually becoming smaller and smaller from first to last. *Legs* (Fig. 185, *f*) horny, light-brown and covered sparsely with hairs; coxæ long and stout, with a rounded swelling at lower anterior edge; femora cylindrical, sometimes distinctly, at others indistinctly, separated from tibiæ, sometimes prolonged into a thorn below, with a distinct carina along the inside, at others not; tibiæ cylindrical, incrassated anteriorly, especially below; tarsi cylindrical and terminating in a distinct claw.

Pupa (Fig. 185, *b*) of the form of *Lachnosterna*.

Described from 12 living specimens.

☞ We learn that the Chinch Bug did much damage in some parts of Illinois and Wisconsin during the dry weather.

☞ Upwards of 1,200 lbs. of Paris green have been sold at LaCrosse this season for the destruction of potato bugs.

THE SLUG ON PEAR AND CHERRY TREES.

"The insect generally called the pear or cherry tree slug (*Selandria cerasi*, Peck) has in our grounds been so few and so little injurious this season that we had almost forgotten to notice it, until, passing the orchard of one of our neighbors a few days since, we saw his pear trees almost entirely denuded of their foliage by reason of the slug. It is a little singular that any cultivator can neglect to guard against such results, when merely dusting the foliage with lime, plaster, or even the ordinary dry soil, will at once destroy the insect. The first brood is now about over, but a second one may be looked for from the fifteenth to the last of this month, and they should be carefully watched for and destroyed by all who wish health and vigor to their young pear or cherry trees."

The above is from a correspondent of the *Journal of Agriculture*, who writes over the signature of "Addi," and whose articles abound in common sense, and are usually very correct; but, in stating that the Pear and Cherry Slug can at once be destroyed by ordinary road dust he has made a very pardonable error, and has been deluded either by hasty observation or by the unreliable testimony of others.

Though not very troublesome in the West, this insect often does much damage in the more eastern States, and it has this year absolutely stripped many orchards of every vestige of green along the line of the Michigan Central railroad, leaving nothing but the seared and yellow leaf robbed of its parenchyma. We found that the popular remedy was sand, there being an abundance of this commodity along the Lakes; but, as our friend Mr. Wm. Saunders, of London, Ontario, has abundantly demonstrated, and as we have ourselves proved, simple sand does not kill. It sticks to Mr. Slug, so that he frequently falls to the ground, and thus it *appears* to kill him, but he very soon manages to divest himself of his sand-covered coat. In fact he naturally sheds this coat several times during his growth, and if the sand is applied at the proper time it proves a positive advantage to him, by stiffening his old and useless skin and thus enabling him the better to crawl out of it. If it be applied a day or two before the proper time to moult has come, then, like a good philosopher, determined to make the best of the circumstances, he concludes with some reluctance to let the soiled habit go before it is quite worn out. Common road-dust is equally harmless, and even plaster will prove ineffectual, unless applied before the last moult takes place; for after this moult the slug bids adieu to his slimy coat. *Moral:* Never use sand or road-dust for the Cherry Slug, but rely on lime, which will burn through the skin to the flesh; or on white hellebore water, which will poison.

APPENDIX TO JOINT-WORM ARTICLE PUBLISHED IN VOL. I, NO. 8.

The following Paper is the only one of a truly scientific nature which our deceased Associate left behind him. It was originally written as an appendix to the "Joint-worm" article published in No. 8 of our first volume, and is twice referred to (pp. 156 and 157) in that article; but, after preparing it, Mr. Walsh concluded that it was too bulky, and of a too purely scientific character, to interest the majority of our readers. He therefore concluded to more thoroughly elaborate it, and send it to Philadelphia for publication in the Transactions of the American Entomological Society. Accordingly he notified Mr. Cresson, Secretary of that Society, that he should send him such a paper for publication. About this time we were fortunate enough to breed, from the eggs of *Phylloptera oblongifolia*, DeGeer, both sexes of the curious little parasite, *Antigaster mirabilis*, n. sp., which is described at the close of this paper, and which Mr. Walsh had, till then, only known in the ♀ sex. On the 23rd of March, 1869, we transmitted to him specimens of both sexes, with such facts regarding them as we possessed, and upon receiving them he deferred sending the Paper to Philadelphia until he should find time to add these facts, with a description of ♂ *Antigaster*. But for a long time subsequently Mr. Walsh was too sick to do any but the most urgent and necessary work. When once his health had improved, and he had succeeded, in a measure, in attending to his accumulated correspondence, he wrote to Mr. Cresson, under date of October 15th, 1869, as follows: "I hope in about a week from now to send that article. There is about two days' work to do on it, and for the last two months I have been trying in vain to get two leisure days to myself." Suffice it to say that, from that time to the day of the fatal accident, he never found the needed leisure, and after his death the Paper was found unfinished. Aware of Mr. Walsh's intention, we immediately sent this paper to Mr. Cresson for publication in the Transactions, accompanied with such of our own correspondence with the deceased as related to the matter.

Upon being recently informed by Mr. Cresson that the amount of other MS. on hand was such that this Paper could not well be published there before next winter, and that there was a disposition to stop publishing for a few years so as to accumulate the income to increase the capital of the Society; we concluded to publish it in our own columns, and thus carry out the

original intention of the author, and render more complete the "Joint-worm" article already alluded to. This paper, from its importance, will commend itself to the scientific portion of our subscribers; and the generalizations contained in it will amply repay its perusal by the more general reader. We shall, as far as we are able, complete it, by adding a description of ♂ *Antigaster mirabilis*. EDITOR.

On the Group Eurytomides of the Hymenopterous Family Chalcididæ:

WITH REMARKS ON THE THEORY OF SPECIES, AND A DESCRIPTION OF ANTIGASTER, A NEW AND VERY ANOMALOUS GENUS OF CHALCIDIDÆ.

BY BENJ. D. WALSH, M.A.

FAMILY CHALCIDIDÆ.

Front Wings veined on the pattern shown in Figures 1, 2, 3, 4, 7 *and* 9.*

This very difficult and very extensive family has hitherto been almost entirely neglected by the entomologists of the United States. I have materials for the revision of all the different groups found in this country; but to complete such a work would require far more space than is here available. Consequently, I shall in this Paper confine myself chiefly to the discussion of one subordinate group, *Eurytomides*, first defining and limiting such genera of that group as I find in my collection, and secondly describing the species in my possession appertaining to those genera, with such brief notes on their natural history as I am able to furnish. Of the other two Chalcidian genera that I shall have occasion to refer to, one is well known to N. A Hymenopterists, and the other is a decidedly new and most anomalous and remarkable genus. In the latter case, I shall, of course, be compelled to publish a new generic name; in the former case, for lack of space to treat the subject as it ought to be treated, I shall simply adopt the established nomenclature.

It will be seen at once, from my notes on the habits of the various species of *Eurytomides*, which it will be necessary to describe, that many of these *Chalcis* flies are parasitic upon several different species, and that occasionally the very same *Chalcis* fly is parasitic upon species belonging to different Orders. (E. g. *Eurytoma studiosa*, Say, and *Decatoma nubilistigma*, n. sp.) In several cases Eurytomidous forms, that appear to belong to the same species, present certain more or less constant differences when they infest different species of insects. Such forms seem to deserve a distinctive name, which I have accordingly given to them, classifying them as mere varieties. Whether they be really varieties, or whether they be distinct species, depends—according to my views—upon the difficult and almost insoluble question, whether such so-called varieties attack indiscriminately the different insects upon which the so-called species to which they are referred is found to be parasitic, or whether each of them exclusively attacks the particular insect upon which it is itself found to be parasitic. In the former case I should classify them as varieties, in the latter case as species; for I have always considered the promiscuous interbreeding of two forms—whether actually ascertained or analogically inferred —as the true test of specific identity; and if such so-called varieties attack promiscuously the different insects upon which the whole so-called species is parasitic, the inference is that they derive that propensity, by the Laws of Inheritance, from interbreeding habitually with the other forms comprehended under the so-called species. If, on the other hand, such a so-called variety confines itself exclusively to that particular insect which it is actually found to infest, then I should infer that it can not interbreed habitually with the other forms referred to the same so-called species; because, if it did so, it would inevitably, by the Laws of Inheritance, acquire a propensity to attack all the different insects which are attacked by the other forms provisionally referred to the same species Consequently, upon this latter supposition, I should pronounce such a so-called variety to be in reality a distinct species.

It is a very interesting fact that a Hymenopterous parasite found in Europe (*Chrysis ignita*), which is exceedingly variable, both in size, in coloring, and in the structural peculiarities of the four terminal teeth of the abdomen—two of these teeth being in one variety (*Merope*) actually obsolete—is also exceedingly variable in the groups of insects upon which it is parasitic. Some, for example, attack the genus *Odynerus* (True Wasps), some the genus *Cerceris* (Digger Wasps), and some the genus *Vespa* (Social Wasps.) Mr. Fred. Smith has suggested, that the variation in size of this *Chrysis* is perhaps due to the variation in size of the larvæ upon which it preys.* May not the structural and colorational variations, also, be due to similar causes, and may there not be distinct races—or, as I should call them, distinct species—of this insect, which prey exclusively or almost exclusively upon distinct groups of Wasps, and have transmitted such propensities by the laws of inheritance to their descendants? In that case, as well as in the hypothetical cases just now referred to among the *Chalcis* flies, we should have Entomophagic Varieties and Entomophagic Species, strictly analagous to what I have described as Phytophagic Varieties and Phytophagic Species. (*Proc. Ent. Soc. Phil.*, III., pp. 403-430; V., pp. 194-216.)

The club of the Chalcididous antenna appears to be normally composed of about three connate and often more or less confluent joints. European authors, in describing the number of joints in the Chalcididous antenna, seem to have always counted the typical joints of the club as true joints. This I have never done, 1st, because they really are not true *bona fide* joints, and, secondly, because in the same species some specimens look as if they had a two-jointed, some as if they had a three-jointed, and some almost as if they had a four-jointed club. But, to prevent confusion, after stating the number of veritable free joints in the antenna—say, for instance, eight—I have always appended the formula "Scape +6+Club," or "Sc.+6+Cl."

As to certain very minute joints which certain European authors have described as existing in certain genera between the pedicel or second joint of the antenna, which is generally short, and the generally elongate third joint or first joint of the flagellum; I believe them not to be true horny joints at all, but mere wrinkles of the connecting membrane. Certainly, in the typical antenna, whether in Hymenoptera or in Coleoptera, the third joint is always a more or less elongate joint, and never a very minute one, as is so often the case with the pedicel or second joint †

SUBFAMILY EURYTOMIDES, Westw.

Collare very long and transverse-quadrate, as in Figure 8, *B, c; hind thighs not swelled.*

GENUS EURYTOMA. (Fig. 1, *a* ♀, *b* ♂.) Body partially contractile, as in *Chrysididæ*, with a deep, finely-sculptured groove for the reception of the middle femora, reaching from the base of the middle coxa to a point immediately beneath

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* It is proper for me to acknowledge here that I have no acquaintance with Fœrster's Monograph of *Chalcididæ*, published in the German language in 1856, under the title of "Hymenopterologische Studien, Part II, Chalcididæ, Proctotrupii."

* For the facts respecting this *Chrysis*, see Mr. Smith's Paper in Stainton's *Entomologist's Annual* for 1862, pp. 80 and 87.

† I have throughout this Paper called the first or long joint of the antenna the "scape," and considered the "flagellum" as commencing with the third joint, calling the small second joint, whenever I have occasion to give it a distinctive name, the "pedicel." This agrees with Say's definition of these terms, except that he treats the prominence or "radicle," as it is technically termed, from which the antenna springs, as a distinct joint of the antenna. It appears also to agree with the terminology generally adopted by Coleopterists and Hymenopterists; at all events, I am informed by Baron Osten Sacken that the terms are defined as above by Schiodte so far as regards Coleoptera. But in Diptera, as I am informed on the same authority, the universal practice is to consider the first and second joints of the antenna as forming collectively the "scape," instead of calling the first joint alone the scape.

the insertion of the front wing. Antennæ ♂ ♀ usually as in Figure 1, *e* ♀, *f* ♂, 8-jointed or 9-jointed (Sc.+6+Cl. or Sc. +7+Cl.), with a club composed of two or three connate and almost confluent joints. Head and thorax very coarsely punctate Abdomen as in Figure 1, *c* ♀, *d* ♂, 8-jointed, polished, and compressed, especially ♀; the peduncle or first joint sculptured, ♂ about as long as the rest of the abdomen, ♀ short; ♂ with the fourth joint, ♀ with the fifth joint very long and finely and closely punctate below. Stigma ♂ ♀ simple.

It is not very easy to see the sutures between the joints in the antenna of ♂ *Eurytoma;* but by examining a great number of ♂♂, where the antennæ were much convoluted, I ascertained that the crook or elbow was always *at the tip* and never *at the base* of any peduncle. Consequently, the real suture is at the tip of every peduncle, as shown in the figure.

Genus Decatoma. (Fig. 2, *a* ♀, *b* ♂.) Body contractile as in *Eurytoma* and with a similar groove for the middle femora. Antennæ ♂ ♀ as in Figure 2, *e* ♀, *f* ♂, ♂ 7-jointed (Sc.+5+Cl.), filiform, the club slightly compressed, ♀ 8-jointed (Sc.+6+Cl.), gradually clavate, the club considerably compressed. Head and thorax very coarsely punctate. Abdomen as in Figure 2, *c* ♀, *d* ♂, 8-jointed, polished, and compressed, especially ♀; peduncle sculptured, ♂ not quite as long as the rest of the abdomen, ♀ about half as long; ♂ with the fourth joint, ♀ with the fifth joint very long. Stigma ♂ ♀ thickened, widened and blackened.

Genus Isosoma. (Fig. 3, *b* ♀; fig. 4, *a* ♀, *b* ♂) Body not contractile and with no groove to receive the middle femora. Antennæ ♂ ♀ as in Figure 4, *e* ♀, *f* ♂, 9-jointed (Sc.+7+Cl.), ♂ filiform and with joints 3-9 subequal in length, ♀ gradually clavate, joints 2 and 4-8 all equally short, 3 longer, 9 about as long as 7 and 8 put together. Head and thorax rather finely rugose. Abdomen as in Figure 4, *c* ♀, *d* ♂, 8-jointed, polished, cylindrical, ♂ with the peduncle short and sculptured, ♀ almost sessile; ♂ with joints 4 and 5 long, ♀ with joints 5 and 6 long. Stigma ♂ ♀ simple.

GENUS EURYTOMA.

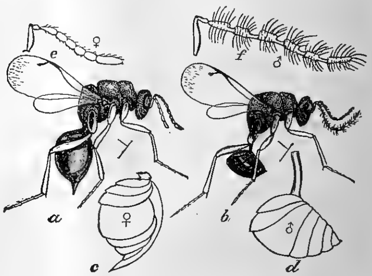
Synoptical Table to find the species described below.

A. Antennæ female, 8-jointed (Sc.+6+Cl.)
  a. Head and thorax partly pale.............................bicolor, n. sp.
  b. Head and thorax entirely black.
    1. Legs, including coxæ and trochanters, entirely or almost entirely pale.........
      † Face male with white hairs; abdomen female banded with pale............... }......prunicola, n. sp.
      †† Face male with golden hairs; abdomen female all black .... }......auriceps, n. sp.
    2. Legs, except the black coxæ, entirely pale.
      † Antennæ female normal.......................punctiventris, n. sp.
      †† Antennæ female with joint 3 much longer than club.......................... }abnormicornis, n. sp.
    3. All 6 coxæ black, femora and tibiæ partly black, each successive pair more and more so...............................
      † Size large ....diastrophi, n. sp.
      †† Size small..studiosa, Say.
B. Antennæ female distinctly 9-jointed (Sc.+7+Cl.)......gigantia, n. sp.

Eurytoma bicolor, n. sp.—♂ ♀ honey-yellow. *Head* subopaque, confluently and very coarsely punctate and with short whitish decumbent hairs; disk of occiput, and a spot enclosing the three ocelli and occasionally (1 ♂) extending in a salient angle nearly to the origin of the antennæ, but usually expanded in front so as only to leave a more or less wide pale orbit on each side, and usually more or less widely confluent behind with the occipital spot, all black. Antennæ ♂ ♀ 8-jointed, ♂ with no peduncle at the tip of joint 7 and joint 8 only ½ longer than 7, ♀ with joints 4-7 subequal in length; ♂ ♀ with the scape honey-yellow except at tip; joint 2 glabrous, shining and black, the remaining joints brown-black. *Thorax* sculptured as the head, but still more coarsely and with whitish pubescence Collare sometimes (1 ♂) with only a dorsal black triangle, usually black on its entire superior and partly on its lateral surface, the black part occasionally (1 ♀) enclosing on each side a pale dot. Mesothorax and metathorax above, except sometimes (1 ♂ 2 ♀) for a small space above the wings, black. *Abdomen* polished and glabrous, but a little hairy towards its tip; black ♂, ♀ black with the venter, and more or less of the lower part of the dorsum, honey-yellow. Legs, including coxæ and trochanters, honey-yellow, sometimes (1 ♂ 1 ♀) immaculate, generally with the femora and tibiæ, especially ♀, more or less lightly tinged or vittate with dusky superiorly, each succeeding pair of legs more obviously so. *Wings* hyaline; veins brownish-white, usually towards their tip end ranging into brown-black Length ♂ 0.11, ♀ 0.08—0.11 inch.

Described from 1 ♂ 2 ♀ bred June 3d, from a rough, woody, subglobular, black fungoid swelling upon the twigs of Black Oak, which is infested by an undescribed Gall-fly, and which also occurs upon Red Oak, but in both cases always very sparingly and sparsely, and never in profusion and locally like the true Cynipidous gall, Q. *podagræ*, Walsh. This fungoid growth is the supposed gall referred to by Osten Sacken in *Proc. Ent. Soc. Phil.* IV, p. 365, note. A very similar but more elongate fungoid growth, which produces no Gall-fly whatever, but from which, as well as from the Oak-fungus, I have bred *Trochilium hospes*, Walsh, occurs locally, but in the greatest profusion upon the Pig-nut Hickory (*Carya glabra*). From this Hickory-fungus, I have bred the following Beetles: 1st, the rare *Chramerus icoriæ*, Lec. (*Scolytidæ*); 2nd, a *Magdalinus*? resembling at first sight *M. barbitus*, Say, but structurally distinct, and 3d, a *Cis* which according to LeConte is most probably *C. pumicatus*, Mellie. I have no doubt that the Gall-fly obtained from the Oak-fungus is inquilinous, as well as the undistinguishable form bred by Mr. Bassett from galls on the stem of some plant supposed to be mustard. (See Osten Sacken, l. c) Not improbably, the real gall-maker of these mustard-galls was some Gall-gnat (*Cecidomyia*). I shall have occasion on a subsequent page to quote several cases, where gall-flies belonging to notoriously inquilinous genera are inquilinous in Cecidomyidous galls. Authors have been sometimes a little too apt to jump to the conclusion that, because a particular insect is bred from a particular gall, therefore it is the author of that gall. No mode of reasoning can be more unsafe and unsound.

[Fig. 1.]



Eurytoma prunicola, n. sp. ♂ ♀ (Fig. 1) Black. *Head* subopaque, confluently and very coarsely punctate, and with short white decumbent hairs dense upon the face. Antennæ ♂ often distinctly 9-jointed with joint 9 rufous, and always with a peduncle at tip of joint 7 but none at tip of joint 8; in the same ♂ one antenna is 8-jointed and the other distinctly 9-jointed; antennæ ♀ always 8-jointed, with joints 4-7 subequal in length, and the club as long as 6 and 7 put together; ♂ ♀ with the scape except sometimes the extreme tip rufous, the other joints brown-black except sometimes the 9th joint ♂. *Thorax* sculptured as the head but still more coarsely, and with white pubescence. *Abdomen* polished and glabrous, but a little hairy towards its tip; ♂ immaculate, ♀ with the long medial or 5th joint always rufous and the 4th generally piceous. *Legs*, including coxæ and trochanters, honey-yellow or rufous; the tarsi and sometimes the tibiæ verging on white. *Wings* hyaline; veins brownish-white, generally shading into brown or even brown-black towards their tips. Length ♂ 0.11—0 13; ♀ 0.10—0.15 inch.

Described from 12 ♂ bred June 9th—19th, a single ♂ bred August 23d, and 31 ♀ bred June 9th—July 1st, all from the Cynipidous oak-gall Q. *prunus*, Walsh, of the preceding year's growth. I observe in this species of *Eurytoma*, as well as in several others, a remarkable variation in the contour of the eye, which might readily be mistaken for a specific character. In most specimens ♂ ♀ the eyes are as smooth as they usually are in mature Hymenoptera; but in 3 ♂ 5 ♀ the surface of the eye is elevated in a number of large rounded whitish or gray tubercles—giving it a very singular appearance.

Variety **globulicola**. Two ♀ bred June 6th from the Cynipidous oak-gall *Q. globulus*, Fitch, of last year's growth, have the abdomen entirely rufous except some more or less extensive basal black stains, but do not otherwise differ.

Eurytoma auriceps, n. sp. ♂. Differs from the preceding ♂ only in the hairs of the head and body, being golden-yellow not white, so that the face has a bright golden instead of a white reflection; in the ♂ antennæ being always 8-jointed and never 9-jointed, joint 8 being long and composed apparently of two connate joints, the apical one sometimes rufous; and in the hind coxa being occasionally tinged with black externally. The ♀ differs from the preceding ♀ in the abdomen being black immaculate, and the hind coxæ and occasionally (2 ♀) a cloud on the anterior middle of the hind femur being black, or (1 ♀) in the entire middle of the hind femur being black. Generally, but not always, the middle and front coxæ are also more or less black. Length ♂ 0.10—0.13 inch, ♀ 0.10—0.14 inch.

Described from 8 ♂ 19 ♀ bred Aug. 31st—Sept. 30th from the Cynipidous oak-gall *Q. erinaceus*, Walsh (=*Q. pisum*, Fitch?) of the same year's growth, and 1 ♀ bred May 6th from the same gall of the preceding year's growth. A single normal ♂ was bred June 2d from the Cynipidous oak-gall *Q. spongifica*, O. S., and four normal ♀ from the Cynipidous oak-gall *Q. hirta*, Bassett, Aug. 30th—Sept. 7th. A single ♀, bred from the Cynipidous rose-gall *radicum*, O. S., is only abnormal by having the entire middle of the hind femur black, as in one typical ♀.

Variety **seminatrix.** Five ♂, bred July 2d from the Cynipidous oak-gall *seminator*, Harris, of the same year's growth, only differ from the normal ♂ in being on the average considerably smaller, and in one ♂ not only having the hind coxæ black, but also the external middle of the hind femur and tibia black, besides an abbreviated black line on the front and middle femora above. Twelve ♀, bred from the same gall July 2d—5th, differ from the normal ♀ in being on the average considerably smaller, and in the legs being more generally and more extensively marked with black, the front and middle femora being often more or less widely vittate with black above. As in the normal ♂, the ♂ has golden hair on the face. Length ♂ 0.08—0.10, ♀ 0.07—0.11 inch.

Eurytoma punctiventris, n. sp. ♀ Differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2d. The long or fifth abdominal joint is finely and closely punctured nearly up to the dorsal line. 3d. The peduncle and joints 2-5 of the abdomen are always black; but the remaining dorsal joints and the venter are occasionally rufo-piceous. 4th. All the six coxæ are black. Length ♀ 0 16—0.17 inch.

Described from 2 ♀, bred from the Cynipidous oak-gall *Q. mamma*, Walsh MS, and 1 ♀, bred July 26 most probably from the fungoid growth on oaks referred to above; ♂ unknown. Comes pretty near to *Eur. auriceps*, ♀ n. sp.; but is distinguishable by the larger size and the strongly punctured fifth joint of the abdomen.

Eurytoma abnormicornis, n. sp. ♀. Differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2nd. The scape of the antennæ is rufous tipped with black; joint 3 is 2½ times as long as wide; 4—7 gradually diminishing until 7 is square; and the club is only 1½ times as long as wide, much shorter than joint 3 or than joints 6 and 7 taken together, and also distinctly rufous. 3d. The abdomen is black immaculate, and as usual is only punctate on its lower surface. 4th. All the coxæ are black, and the hind femora and middle tibiæ clouded with dusky. Length ♀ 0.16 inch.

Described from 1 ♀ captured at large; ♂ unknown.

Eurytoma diastrophi, n. sp. ♂ ♀ Differ from *Eur. prunicola* only as follows: 1st. In the antennæ the scape, if rufous at all, is only basally so, and occasionally is black immaculate. 2d Antennæ ♂ are 8-jointed as in *auriceps*, but much shorter ♂ ♀ than either in *prunicola* or *auriceps*, and without any peduncle ♂ at tip of joint 7, as in ♂ of those two species. 3d. Abdomen ♀ is black immaculate 4th. In the legs the coxæ are all black, as also the hind femora and hind tibiæ, except at the base and tip; and the femora and tibiæ of the middle legs, and femora of the front legs, are often more or less marked with black externally. Length ♂ 0.11—0.12, ♀ 0.11—0.15 inch.

Described from 2 ♂ 19 ♀, bred May 11th—June 1st, from the Cynipidous bramble-gall of *Diastrophus nebulosus*, O. S. Six ♂ two ♀, bred May 24th—July 23d from the oak-fungus mentioned above, agree in every respect. I possess also 1 ♂ 9 ♀ captured at large.

Variety **Bolteri**, Riley. ♀ differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2d. The antennal scape is black immaculate. 3d. The abdomen is black immaculate. 4th The hind legs are black except the knees and the tips of the tibiæ, which are honey-yellow; the four front legs are honey-yellow except the coxæ, trochanters, the base and outer middle of the femora, and a more or less abbreviated external vitta on the tibiæ; all the six tarsi verge upon white. Length ♀ 0 16—0.18 inch.

Described from 1 ♀ bred Aug. 27th, from the lepidopterous golden-rod gall of *Gelechia gallæsolidaginis*, Riley; another ♀ bred May 20th, its parentage unknown, and a third ♀ captured at large; ♂ unknown. Mr. Riley has described the ♂ in his *First Report* (p. 177), but almost all the characters that he gives are generic and not specific.

Eurytoma studiosa, Say. ♂ ♀ scarcely differ from the normal type of the preceding except in their much smaller size, in the antennæ being as long as in *Eur. prunicola*, and in the antennal scape being always black immaculate. Recognized from six ♂ six ♀, bred Sept. 7th—24th from the Cynipidous oak-gall *Q. ficus*, Fitch, of the same year's growth, and seven ♂ nine ♀, bred May 10th—June 5th, from the same gall of last year's growth.—Length ♂ 0.04—0.09, ♀ 0.05—0.11 inch.

The following, bred from galls of various kinds, do not differ materially either in size, structure or coloration from the above. 1st. FROM CYNIPIDOUS OAK-GALLS; 1 ♂ 3 ♀, bred July 2—11, from *seminator*, Harris; 1 ♀, bred Sept. 18, from *Q. hirta*, Bassett; 1 ♂, from *Q. spongifica*, O. S.; and 2 ♂ 1 ♀, from the undescribed leaf-gall on Burr Oak, *Q. fragaria*, Walsh MS. 2nd. FROM TENTHREDINIDOUS WILLOW-GALLS; 3 ♂ 1 ♀, bred May 5—24, from *S. nodus*, Walsh; 4 ♂ 2 ♀ bred May 14—20 from *S. gemma*, Walsh; 1 ♂ 4 ♀ bred May 28—June 19, from *S. ovum*, Walsh; 4 ♂ 7 ♀ bred May 13—June, 8 from *S. ovulum*, Walsh; and 10 ♀ bred Aug. 13—Sept. 6, from *S. pomum*, Walsh. 3rd. FROM CECIDOMYIDOUS GALLS; 1 ♂ 1 ♀ bred Aug. 2—11, from the willow-gall *S. brassicoides*, Walsh, and 1 ♀ ascertained to be parasitic on *Cec. cornuta*, Walsh, which is inquilinous in that gall; 4 ♂ 2 ♀ bred May 19—22, from the willow-gall *strobiloides*, O. S ; 3 ♂ 7 ♀ bred May 21—June 9, from the willow-gall *S. batatas*, Walsh; 8 ♂ 10 ♀ from the goldenrod-gall *solidaginis*, O. S.; and 6 ♂ 2 ♀ from the same gall growing on ironweed. 4th. Two ♀ bred from the APHIDIAN LEAF-GALL *Caryæglobulus*, Walsh, growing on Shellbark Hickory. 5th. From the undescribed COCCIDOUS LEAF-GALL *Caryæ-fallax*, Walsh MS., growing on Shellbark Hickory, 7 ♂ 3 ♀ bred June 30. 6th. One ♂ bred from the BLACK FUNGOID SWELLING on Pignut Hickory referred to above.

The following only differ from *Eur. studiosa*, Say, in having the base of the antennal scape more or less rufous, especially in ♀; 2 ♂ 4 ♀ bred Aug. 31—Sept. 9, from the oak-gall *Q. erinaceus*, Walsh, of the same year's growth, and 1 ♂ bred April 9 from the same gall of last year's growth; also 1 ♂ 1 ♀ bred from the oak-gall *Q palustris*, O. S., of the same year's growth.

I possess also 8 ♂ 33 ♀ captured at large, which should probably be referred to Say's species. I have been unable to identify *Eurytoma orbiculata*, Say, described in ♂ sex only, and the laws of coloration seem to me to forbid the existence of any species of *Eurytoma* with such legs as Say describes in this species. According to him, the legs are "honey-yellow, with the thighs, except at their origin and extremity, black." Now, 1st, if the thighs were much marked with black, the coxæ would necessarily also be more or less black, whereas they are by implication described as "honey-yellow;" 2nd, if the front femora were mostly black, as he describes them, the hind tibiæ would most probably be more or less black. For it is a very general law in *Chalcididæ* that each successive pair of legs is more and more marked with black. In *Ephemeridæ*, on the contrary, the front pair of legs is normally by far the darkest, the four hind legs being nearly alike in their coloration. And so with other families of insects—each will be found to be marked according to certain general colorational laws. Why, if it be the correct doctrine that every species was independently created, the great Author of Nature should have restricted himself, in the case of each family, to certain definite colorational patterns, is a mystery which I have never yet been able to solve. Neither do those who still cling to this almost exploded doctrine make the least attempt to solve this insoluble enigma, but, in the words of Mr. Wallace, are content to "register the facts and wonder."

Eurytoma gigantea, n. sp. ♀ Black. *Head* subopaque, confluently and very coarsely punctate, and with short whitish decumbent hairs. Antennæ 9-jointed, the joints proportioned to each other as 14, 3, 6, 5, 5, 4, 4, 4, 6, the flagellar joints longer than usual in proportion to their breadth, the penultimate joint being 1½ times as long as wide. *Thorax* sculptured as the head, but still more coarsely. *Abdomen* polished and glabrous but a little hairy towards its tip, more compressed than usual, and with the usual fine punctation on the 5th or long joint extending almost up to the dorsal line. Ventral valve unusually long and acutely porrect. *Legs* black, the knees and the tips of the tibiæ, and in the front legs the entire tibiæ, all honey-yellow; tarsi, except their extreme tips, whitish, the anterior tarsi pale honey-yellow. *Wings* hyaline; veins honey-yellow. Length ♀ 0.19—0.25 inch.

Described from 2 ♀ captured at large; ♂ unknown. By far the largest species that I have seen, and readily distinguishable by the 9-jointed antennæ, the suture between the 8th and 9th joint being as distinctly a free suture as any of the others.

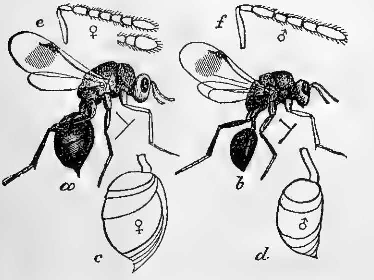
GENUS DECATOMA.

Synoptical table, to find the species described below.

A.—A distinct stigmatic dark band on the front wing.
- a. Body mostly black.
  - 1. Head mostly pale - - - - - - - varians, n. sp.
  - 2. Head entirely black - - - - - - - nigriceps, n. sp.
- b Body almost entirely pale - - - - - nubilistigma, n. sp.

B.—No stigmatic dark band.
- a. Body mostly black - - - - - - hyalipennis, n. sp.
- b. Body almost entirely pale - - - - simplicistigma, n sp.

[Fig. 2.]



Decatoma varians, n. sp.—♂ ♀ (Fig. 2) pale ochre-yellow ranging through honey-yellow to rufous. *Head* subopaque, confluently and very coarsely punctate. A black spot on the vertex, sometimes not extending beyond the ocelli, sometimes covering the whole vertex, and very rarely (1 ♀ spring brood, 1 ♀ autumnal brood) extending over the superior half of the occiput. Antennæ ranging from pale honey-yellow to rufous, the flagellum very rarely (1 ♀ spring brood, 1 ♀ autumnal brood) brown-black above. *Thorax* sculptured as the head, but still more coarsely, collare generally either immaculate or with only a basal black band, rarely with a subquadrate black patch covering the entire superior surface, and sometimes with only the lateral and basal limits of this patch black. Mesonotum and metanotum black, generally with the sutures and the entire postscutellar triangles of the mesonotum (Fig. 8, B, *d*) yellow or rufous. Pleura usually immaculate, rarely a little varied with black, *Abdomen* highly polished, with the peduncle ♂ nearly ⅔ as long, ♀ 1-5 as long as the rest of the abdomen; ♂ ♀ black with the peduncle, two or three of the basal joints and the venter often more or less piceous or rufous or honey-yellow; in one ♂ the entire abdomen, except a dorsal black patch behind, being honey-yellow. *Legs* rarely immaculate, usually with an abbreviated, narrow black superior vitta on the femur, which becomes wider and longer in each successive pair of legs, and occasionally in the hind femur covers the whole of it except the extreme base and tip; tibiæ the same, but the front tibiæ are almost always immaculate, and the hind tibiæ are generally black throughout except their extreme base and tip; coxæ and trochanters immaculate, but the hind coxæ are more or less widely vittate or bivittate with black above, except their extreme base and tip. *Wings* hyaline; stigma black, veins and stigmatic patch brown-black, the latter extending ⅔ of the way across the wing, and almost always widened behind so as to appear bottle-shaped, the stigma forming the neck of the bottle. Length ♂ 0.09—0 14, ♀ 0.10—0.16 inch.

Described from 26 ♂ 25 ♀, that came out from the Cynipidous oak-gall Q. *podogræ*, Walsh, of the same year's growth, September 4th—Oct. 11th, and 6 ♂ 2 ♀ that came out from the same gall, only of last year's growth, May 21st—June 21st. From the Cynipidous oak-gall Q. *spongifica*, O. S., I have obtained 1 ♂ 7 ♀, differing in no respect from those produced by the other gall (Q *podagræ*), except that they varied in size still more remarkably, the ♂ being only 0 07 inch and the largest ♀ as much as 0.16 inch long. From the allied oak-gall, Q. *inanis*, O. S , I bred a single ♂ of average size and coloration. A single rather small ♀, bred from the Cynipidous oak-gall, Q. *palustris*, O S., growing either on the Black or Laurel Oak, has the occiput black above and the antennæ brown-black above; but it is otherwise normally colored. I possess also 2 ♂ 1 ♀ captured at large, that do not differ from the normal form. This is an exceedingly variable species, both as regards size and coloration.

Variety **dubia,** ♂ ♀.—This form differs from *D. varians* only as follows: 1st. The average size is much larger. 2d. The coloration is darker, nearly the entire occiput, and the entire face except the antennal groove and the anterior border, the entire mesonotum including the postscutellar triangles, (*Fig.* 8, B, *d*), almost the entire pleura, and the entire abdomen, being black. 3d. The stigmatic dark band is never bottle-shaped, but is of the same width as the stigma throughout. Length ♂ 0.15, ♀ 0.16 inch.

Described from 1 ♂ 5 ♀, bred May 21st—29th, from the Cynipidous Oak-gall Q. *mamma*, Walsh MS., of the preceding year's growth. This gall, it should be observed, grows not only on a different species of Oak (Burr Oak) from those on which the galls producing *D varians* grow (Black, Red and Laurel Oaks), but also on a species belonging to a distinct subdivision of the genus. Out of a total of 32 ♂ 27 ♀ of *D. varians*, bred from the gall of Q. *podagræ*, but 3 ♀, measuring 0.10—0.15 inch, agree with the form *dubia*.

Decatoma nigriceps, n. sp.—♂ ♀ differ from the normal form of *D. varians* only as follows: 1st. The average size is much smaller, and the average color much darker. 2nd. It is perceptibly a less elongate species ♂ ♀. 3rd. The head is entirely black, as indeed is almost the case with variety *dubia* of the preceding. 4th. The antennæ are always basally brown-black, though often dull rufous towards their tips, the scape being always brown-black, which is never the case in *varians*, even in the dark variety *dubia* 5th The entire thorax and abdomen are black, save that usually there is a more or less extensive honey-yellow or rufous spot on the side of the collare, which in one autumnal ♀ extends over its anterior half above, and save that in one vernal ♂ the suture at the tip of the abdominal peduncle is rufous, and in one autumnal ♀ the lower part of the abdomen is piceous. 6th. The legs are on the average more heavily marked with black, and the coxæ are chiefly black. 7th. The dusky stigmatic patch is never widened behind the black stigma, is of a pale tint with its posterior boundary less definitely marked, and is occasionally reduced to a short dusky cloud, reaching only half way or even one-third of the way across the wing. Length ♂ 0.05—0.10, ♀ 0.07—0.10 inch.

Described from 3 ♂ 2 ♀, bred Sept. 22nd—24th, from the Cynipidous Oak-gall Q. *ficus*, Fitch, of the same year's growth, and 40 ♂ 16 ♀, bred May 8th—20th, from the same gall of the preceding year's growth. This species presents some remarkable analogies with the variety *dubia* of the preceding; and the gall Q. *ficus*, in which it is parasitic, grows on White Oak—a species belonging to the same group of Oaks as the Burr Oak, on which the gall that produces *dubia* occurs.

Variety **excrucians**, ♂ ♀. Three ♂ one ♀, bred July 2d from the Cynipidous gall *seminator*, Harris, which grows exclusively on White Oak, differ from the normal form of *nigriceps* only in the scape of the antennæ being dull rufous instead of brown-black. The antennal groove is black.

Decatoma hyalipennis, n. sp.—♂ black. *Head* subopaque, confluently and very coarsely punctate; orbits, narrowly interrupted above; the face below the antennæ, cheeks, and mouth, pale yellow. Antennæ dull yellow, joints 2 and 3 dusky above. *Thorax* sculptured as the head, but still more coarsely. Collare pale yellow, except a wide dorsal vitta. Wing-scale and a longitudinal line above it, pale rufous. *Abdomen* highly polished, piceous below. Peduncle ⅔ as long as the rest of the abdomen. *Legs* pale yellow, basal ⅔ of the hind coxæ, and a patch above on the middle of the hind femora, black. *Wings* hyaline; veins brown; stigma black. No vestige whatever of any stigmatic cloud or patch. Length ♂ 0.08 inch.

The ♀ differs from the ♂ only as follows: 1st. The orbits are wider and not interrupted above, and the face and cheeks are yellow higher up. 2nd. The antennæ are dusky above to their tips. 3rd. The black vitta on the collare is narrower and sometimes abbreviated. 4th. The mesonotal sutures are more or less widely yellow, and the pleura and metathorax are stained with yellow. 5th. The abdominal peduncle is, as usual in the ♀♀ of this genus, considerably shorter, and the venter, and sometimes also the lower part of the abdominal dorsum, are honey-yellow. 6th. The legs are immaculate

Described from 1 ♂ 2♀, all three captured at large. Resembles the paler varieties of *varians*, but is sufficiently distinct by the total absence of any stigmatic dark patch. It may possibly be the case that the ♂ and ♀ here described belong to distinct species.

Decatoma simplicistigma, n. sp.—♂ ♀ pale ochre-yellow. *Head* subopaque, confluently and very coarsely punctate; disk of the occiput, ocelli, and sometimes a curved band connecting the ocelli and which is rarely (1 ♂ 1 ♀) confluent by a narrow tongue with the occipital spot, all black. Antennæ with the flagellum slightly obfuscate above, and joint 2 usually black above. *Thorax* sculptured as the head, but still more coarsely. Collare rarely (1 ♀) with a narrow dorsal black line; mesonotum with a more or less slender dorsal black triangle, the base of the triangle usually starting from the suture behind the collare, sometimes from the hind part of the collare, and the apex of the triangle approaching more or less nearly, but never quite attaining the scutel. Occasionally on each side of this black triangle two or three black dots are placed in the suture behind the collare. On the scutel a more or less wide dorsal black line not quite attaining its tip. Very rarely (1♀) the entire mesonotum is immaculate, mesothorax always with a more or less wide dorsal black line, which is almost always prolonged in a curve behind the mesothoracic scutel to the origin of the front wing. *Abdomen* highly polished, with the peduncle ♂ ♀ as in *varians*, the yellow color often merging more or less into rufous. Peduncle above and below, a dorsal line not attaining the tip, which generally expands upon each suture into a lateral tooth, and is sometimes dilated into one large dorsal patch, all black. *Legs* immaculate; but the suture at the origin of the hind coxæ is black. *Wings* hyaline; veins brown; stigma black; no vestige of any stigmatic cloud or patch. Length ♂ 0.06—0.11, ♀ 0.8—0.11 inch.

Described from 7 ♂ 14 ♀, bred Aug. 31st—Sept 30th, from the Cynipidous Oak-gall Q. *erinaceus*, Walsh (=Q. *pisum*, Fitch?) of the same year's growth, which occurs on White Oak. Two ♂, bred June 24th and July 8th, from the Cynipidous Oak-gall *Q. petiolicola*, Bassett, of the same year's growth, which occurs on Swamp White Oak, and one ♀ bred from the Oak-fig gall, which occurs on White Oak, differ in no respect from the described type.

Decatoma nubilistigma, n. sp.—♂ ♀ differ from the preceding only as follows: 1st. The general color is ochre-yellow, ranging through honey-yellow to rufous. 2nd The ocellar black spot is never confluent with the occipital black spot. 3rd. The collare is always immaculate, and also (except 5 ♂ 4 ♀) the mesonotum, and (except 2 ♀) the scutel. 4th. The curved black line behind the scutel is usually expanded, in connection with the metathoracic black vitta, into a broad black triangle, the apex of which does not quite attain the abdominal peduncle. 5th. In the abdomen the peduncle is either immaculate or only vittate above with black. 6th. The femora and tibiæ have a linear abbreviated superior black vitta, scarcely perceptible in the front legs, and more obvious in each successive pair of legs. 7th. The front legs have a pale fuscous cloud, scarcely wider than the stigma is long, extending from the stigma from ⅓ to ⅔ of the way across the wing, or (1 ♀) only ⅓ of the way. Length ♂ 0.08—0.10; ♀ 0.07—0.12 inch.

Described from 9 ♂ 29 ♀, bred May 7th—11th, from the Cecidomyidous Willow-gall *S batatas*, Walsh, of the preceding year's growth. Eleven ♂, bred June 2d, from an undescribed gall closely resembling *Q. tuber*, Fitch, but occurring not on White Oak but on Swamp White Oak, and in all probability Cynipidous, agree in every respect with the described types. I possess also a single normal ♀ captured at large.

[To be continued.]

A WORD FOR THE TOAD.

During the past week the Striped Potato-bug (*Lytta vittata*) came into my potato patch, and in two days defoliated about a thousand hills, when four of us set to work gathering them. In one hour we gathered a full gallon. Where did such a quantity of these bugs come from in so short a time? But the most curious part is to come. A black boy who was helping me said he did not like to gather the bugs, because wherever they were numerous he found a lot of toads, and he was afraid of toads. This attracted my attention, as I had seen a number of toads myself; and to my serprise I found that they were eating the bugs. One fellow ate twelve bugs, at the rate of four per minute. He would not eat any faster, although we ran the bugs all around and over him. Has any one else noticed this? It is certainly new to me, for I did not think anything would eat these Blister Beetles. The Ladybird is shy of them; and, so far as I have observed, none of the common cannibal beetles will attack them. S. F. T.

HANNIBAL, Mo., July, 1870.

INSECT DEPREDATIONS.—If I were to estimate the average loss per annum of the farmers of this country from insects at $100,000,000, I should doubtless be far below the mark. The loss of fruit alone by the devastations of insects, within a radius of fifty miles from this city, must amount in value to millions. In my neighborhood the peach once flourished, but flourishes no more, and cherries have been all but annihilated. Apples were till lately our most profitable and perhaps our most important product; but the worms take half our average crop and sadly damage what they do not utterly destroy. Plums we have ceased to grow or expect; our pears are generally stung and often blighted; even the currant has at last its fruit-destroying worm. We must fight our paltry adversaries more efficiently, or allow them to drive us wholly from the field.—*Horace Greeley.*

ERRATA.—Page 276, column 1, line 8 from bottom, for "*quinquemacalata*" read "*quinquemaculata*;" same page, column 2, line 16 from bottom, for "Shaffer" read "Saffer."

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

Do not disseminate injurious Insects—*Ridgewood, N. J.*—A few days ago I was asked to purchase some damaged grain for feeding out to stock; but, upon examining the same, I concluded that the best thing to be done with it was to burn or boil the same on the premises; and this course I advised without delay. It was all infested like the ear I send [with larvæ of Angoumois Grain Moth]. In the same room there were beans, all bored through by the Bean Weevil enclosed [*Bruchus obsoletus*, Say]. You can well imagine my surprise to find this insect in such large numbers; and it is surely time that entomologists sounded the tocsin, and waked up our agriculturists upon this insect question. I know that there are thousands of farmers in our country who will not pay two dollars a year for the Entomologist, just because they think it is economy not to do so, while at the same time they lose hundreds every year in consequence of their ignorance of what this periodical teaches. Not one farmer in a thousand would know this corn insect if it should come to him in purchased grain, consequently he would not hesitate to sow affected seed, and thereby bring ruin to himself and neighbors. I bid you God speed in your great work. If coaxing will not do, scold, fret and condemn, with an unsparing pen, those who will persistently ignore the value of entomology to our people. It is a pity, as well as a disgrace to our nation, that we have no money to aid science—which is only another word for prosperity—while there are millions to squander upon things, and even ideas, which will never benefit us as a people, nor bring happiness to one individual. A. S. Fuller.

A Rove-beetle as a Parasite on the Cabbage Maggot—*Boston, Mass., July* 18, '70.—Since I sent you the box containing larvæ, &c., I have bred a new parasite from part of the same lot; perhaps some of your pupæ produced *Staphylinadæ* instead of *Diptera*. I believe this fact new to science, at least it is so to us here. Early this spring my neighbor, Com. John Pope, called my attention to a fly larva destroying his young cabbage plants, just set out. I also found, on looking over my own, some that were wilted during the heat of the day, which proved, upon examination, to be caused by the same insect at work on the roots. I found from ten to thirty of different sizes on each infested plant. They destroy all the tender rootlets, and follow the centre of the main stock to the surface of the ground, finally killing the plant. This enemy, new to this particular location, I immediately took steps to become more familiar with. After transplanting some of my cabbages to my breeding cases, I left one strong, healthy stock, which I suspected of being infested, to remain in the ground until it was perfectly dead, when I opened the hill, June 20th, and took therefrom twenty-six pupæ, part of which I put into two boxes, one with moist earth the other dry. On opening them, July 12th, I found in each a perfect fly, which proved to answer exactly to the description given by Dr. Fitch, in the New York State Agricultural Report for 1866-7, of the Cabbage Fly (*Anthomyia brassicæ*, Bouché). On again examining my boxes, July 15th, I found a pretty little black Rove-beetle (*Staphylinus*), 0.15 inch long, and new to my collection. I then presumed it came from a pupa accidentally put in the box with the soil; but when I again opened my boxes, July 17th, what was my surprise to find in each three more of the same species of beetle. Upon further examination, I found six of the fly pupæ with a rough hole gnawed through the side, and as my boxes were perfectly tight, I had but one conclusion to come to. After a careful examination with the microscope of the remaining pupæ, I could detect no break in them, each segment or ring was entire. On examining the balance I found one live and one dead imago in one pupa, and the rest fly pupæ alive; thus proving beyond a doubt that either the eggs, or what seems more probable, the young larvæ of this *Staphylinus* entered the fly larvæ long before they had arrived at maturity. Philip S. Sprague.

[It would be well for our correspondent to determine the species of *Staphylinus* which plays in this new role, and we shall be glad to hear further from him.—Ed.]

Oyster-shell Bark-lice in Mississippi; Apple-tree Root-louse—*Carthage, Miss., July* 18, '70.—I am satisfied that we have the Oyster-shell Bark-louse in this neighborhood. I last winter cut down and burned about 200 apple trees which were infested with it. It was mostly on three or four large trees, from which it seemed to have spread to the others, which were small nursery trees. I kept a few of the limbs mostly infested, and thought that I should send them to you, but they have been mislaid in some way, so that I am unable to find them. There is no doubt, however, I think, but that it is the real Oyster-shell Bark-louse; it suits your description exactly. I examined under a great many of the "shells" and found most of them empty. I found the white eggs under only one or two of the scales which I examined, the rest being apparently empty. I notice that, on page 213, Vol. II, in answer to B. P. Hanan, you say you can not repeat what you have already written, but refer him to an article in your first State Report. That is certainly very unsatisfactory to us down here, unless you have the Reports to send out gratuitously to all who may be interested in this matter. We take the Entomologist in order to get information on such subjects. I hope you will let us have an exhaustive article on the Oyster-shell Bark-louse.

The "Apple-root Plant-louse" does not kill most of the trees which it infests in this part of the country. They are very troublesome, and I should like to know some expeditious way to destroy them; but I think they seldom kill a tree outright. The apple trees in this country are mostly liberally supplied with them. I notice that you advise scalding them. That will do very well where the water is poured around the tree as it stands in the ground; but, by way of experiment, I tried dipping the roots of small trees in hot water—the water being nearly boiling hot—and the trees I "dipped" were all killed. J. W. Merchant.

[We shall defer our remarks on the Oyster-shell Bark-lice until we manage to get specimens from your locality, for at present we can only give opinions. We do not believe that the species can thrive, or even exist, in your latitude; and, from your remarks, incline to believe that your lice were imported and have died out. We have never heard of their injuries in Mississippi, and if they have ever proved injurious it will be easy enough to ascertain the fact. There are dozens of common and injurious insects of which we wish to give accounts, but, as everything cannot be published at once, we generally give priority to such subjects as are comparatively little understood, and which for the time interest the greatest number. It is not necessary to have the water in which to dip the apple trees too near the boiling point. A heat anywhere from 120° to 150° will suffice, and the roots must be immersed a different length of time according to the temperature. It may be used much hotter, however, when poured on the ground.—Ed.]

Nest of the Bald-faced Hornet—*Carthage, Miss.*—In your April number, in an article on the Bald-faced Hornet, by Henry Gilman, he says: "I once found in the woods, on the north side of Lake Michigan, a wasp nest nearly twice as large as a man's head. * * * This was the largest nest I ever saw." I have seen them here as large as an ordinary water bucket, and over a foot in diameter. J. W. M.

Queen Humble-bee—*LeRoy, N. Y., June* 1, 1870.—On May 24th I found this queen Humble-bee (which I now enclose you) in its nest, which was a deserted mouse nest. A mass of pollen found in this nest contained twelve eggs, which were placed in a circle, and upon their ends, around a small central ball of pollen. A single cell filled with honey was also found in this nest, and this cell had evidently just been completed when the queen was captured. I have always understood that no honey was collected until after the birth of the first brood—the cells thus emptied being then used as honey-cells. Of what species is this queen? it is marked 1; the other species, marked 2, is much less common here. J. Campbell, Jr.

[No. 1 is ♀ *Bombus pennsylvanicus*, DeGeer, and No. 2 is ♀ *B. ferviclus*, Fabr.—Ed.]

Attraction of Male Moths to the Female—*Fairfield, Iowa, July* 22, '70.—Enclosed find a cocoon of *Attacus cecropia*. It was brought from Pennsylvania last fall. Ten days ago it gave forth a moth, which was placed under a common flour sieve. In a very short time *eleven* moths of the same kind were under the sieve. The gentleman insists that eleven were "hatched" from this one cocoon. I suggested that only one could possibly have come from it, and that the others had been attracted to it, as is often the case. But how did the moths get under the sieve? There is no possible way for this to be done; and the folks are satisfied that the eleven moths actually came from the one cocoon—another impossibility. Can you solve the matter? I went to the house, saw the cocoon and moths, and am satisfied the people would not wittingly practice a deception upon me.

J. M. Shaffer.

[The attractive power of the female moths, and especially of those belonging to the same family (*Bombycidæ*) as the Mulberry Silk-worm, is very great, and the only solution that can be given of the above problem [?] is that the moth hatched from the cocoon was ♀, and that the ♂♂ were attracted to her, and managed to lift the sieve and get under it. It is well known that these ♀ moths will collect, or "semble" the ♂♂ from long distances, though whether by some peculiar odor or by some other power is not yet satisfactorily decided. If all the circumstances relating to the above occurrence were considered in detail, we should doubtless find nothing strange about it. Of course, no more than one moth issued from the cocoon.—Ed.]

Death to House Flies—*Marshall, Mo., July 18, '70.*—Provide yourself with a fine-mesh insect net, similar to that in common use among entomologists, or what would be better, a net shaped like an entomologist's water net, and about a foot in diameter. Attach to this a handle long enough to reach the ceiling. Get ready a vessel of scalding water, a common wash-basin filled answering very well. About dusk, when the flies have gone to roost on the walls, commence. With a rapid motion move the net along, gathering in the flies till the body of them are unsettled. What you have in the net make sure of, by grasping it next the hoop with the hand. Shake the flies to bottom of net, and dip in the hot water; and when they are dead turn the net and shake them out. By this time the rest will be settled, when proceed as at first.

J. L. Townsend.

A Coincidence—*Baltimore, Md., August* 4, 1870.—On a hot summer's night in the country, a few years ago, I was reading Grote's description, and admiring the figure of his beautiful little *Philomma Henrietta* (Proc. Ent. Soc. Phil., Vol. III, p. 3, pl. II). I naturally desired to have a specimen of the insect; but as Grote indicated "Eastern States" as its habitat, I had no hope of securing one except by exchange or purchase. As I was thus reading and reflecting, lo! to my intense satisfaction—I will not say frantic delight—the identical species alighted *upon the very page* which I was reading; the only specimen I had ever observed before or have seen since! Was not this strange? I will not philosophise about it, but I consider it worth mentioning. Of course I took this stranger in and treated him accordingly. We, down here, do not reckon ours among the "Eastern States," and if our New York friend does not, he will have to give his little beauty a wider geographical range in his next edition. Jno. G. M.

Seventeen-year Locust two Years too late—*Baltimore, Md.*—1868 was our *Cicada septemdecim* year. Early in July of this year I found a solitary individual behind time, and *she* looked as if she had no business here. *She* was the most desolate, companionless, forsaken thing imaginable. Her family had all perished two years ago; and though she came forth in full maturity, and was clean looking enough, yet she had not a single beau—the most solitary maiden you ever saw! I took her in, and gave her a dose of diluted alcohol, but that did not revive her, but made her so drunk that she died in a surfeit. I thought possibly it might be *C. Cassinii*, but Uhler compared her with a number of specimens of the brood of 1868, and found her a true *seventeener;* she had much more red on the vent, and on the sides of the pronotum, than the *C. Cassinii*. What occasions the retardation in the development of some insects? It could not be climate or peculiarity of soil, or exposure to winds, or anything else I can think of, in the instance in question, for in 1868 the number proceeding from the very same spot was countless.

This reminds me of informing you that our Lancaster friend, Rathvon, was a little mistaken in presuming that this would be the year of the appearance of the Cicada in Kreutz Creek Valley, York county, Pa., as stated by him several months ago in your journal. I have made diligent inquiry of persons familiar with that district, and they report no locusts. Now, it may be that he gives that title to a district different from that which I know by that name (for I was born in that vicinity), but the Kreutz Creek Valley, 7 or 8 miles east of York, and bordering on the Susquehanna, was not visited this year by this singular Cicada. It is a pity, for thereby we lose one proof, at least, of their regular periodic appearance, and that is not pleasant; but I hope that Mr. R. will be able to explain it, so that the old theory may still be maintained. Jno. G. M.

Food-plant of the Southern Cabbage Butterfly—*Port Byron, Ills.*—In No. 3 of the present volume, you say that you do not know that the larva of *Pieris protodice* ever feeds on anything but Cabbage. Last summer I found one feeding on wild Pepper-grass, a plant of the same order as the Cabbage. I once found a chrysalis on a low hickory shrub, but that, of course, does not prove that it feeds on Hickory, else it also feeds on limestone, as the first chrysalis of the kind I ever saw was attached to a lime rock. And now I wish to thank you, and your most liberal publishers for the beautiful likeness of *Cecropia* in a late number. It seems to me perfect, and the most beautiful wood-cut I ever saw. Marion Hobart.

Insects around Indianapolis—*June* 28, '70.—The Currant Worm (*Nematus ventricosus*) has made its first appearance this year with us in limited quantities. There has also appeared on the Alder, in our river bottoms, a similar larva, which has completely devoured the foliage of these bushes. The Colorado Potato-bug has begun its work, and bids fair to be very destructive. Jno. W. Byrket.

Colorado Potato Beetle in Indiana.—The Colorado Potato Beetle has so injured many of the potato fields in Clark county, in this State, that they have been plowed up. L. G. Saffer.

REARING EGGS OF BUTTERFLIES.—I have been so successful this season in persuading female butterflies to deposit their eggs in captivity, that I think it well to mention the matter in the *Entomologist.* Last season I found it impossible to induce *P. marcellus* to lay upon leaves or stems of pawpaw that had been cut. This spring I placed a nail-keg, from which the bottom had been knocked out, the top being covered with cloth, over a low pawpaw growing near my house; and on confining a female *Ajax* therein, she at once began to deposit her eggs, and continued till the number reached more than twenty. In a few days the young larvæ came out, and with very little trouble I succeeded in raising several of them to the chrysalis state, in which they now are. (I expect to prove by this brood that *Marcellus* and *Ajax* are but different broods of the same insect; a fact I have felt confident of for some years past, but which I could not absolutely establish for want of the link which this experiment will supply.) I afterwards treated other females of *Ajax* in the same manner, and with the same results. A *C. philodice,* confined in the same way with growing clover, at once deposited a great number of eggs. So did *Nisioniades lycidas* and *N. pylades,* Scudd., upon *Hedysarum.* In fact, in every instance so far tried, the females have obliged me with as many eggs as I wanted; and I incline to think this mode of taking eggs will always be successful.—*W. H. Edwards, Coalburgh, West Va., in Canadian Entomologist.*

ON OUR TABLE.

NOTES ON GRAPTAS C. AUREUM AND INTERROGATIONIS, Fab. By Wm. H. Edwards.

THE COUNTRY GENTLEMAN'S MAGAZINE, for June, 1870. London (Eng.): Simpkin, Marshall & Co., publishers.

GEOLOGICAL SURVEY OF INDIANA for 1869. Also, Maps and Colored Sections, accompanying the same.

INJURIOUS INSECTS, NEW AND LITTLE KNOWN. A. S. Packard, Jr., M D. March, 1870.

GLIMPSES OF NATURE. A Magazine of Natural History in all its branches. Edited by Samuel M. Maxwell, Mauch Chunk, Pa.

THIRD ANNUAL REPORT OF THE OHIO STATE HORTICULTURAL SOCIETY, for 1869.

MONTHLY REPORTS OF THE DEPARTMENT OF AGRICULTURE FOR THE YEARS 1867-8. J. R. Dodge, editor. Washington, D. C.

NATIONAL EDUCATION: An Address delivered before the Illinois Wesleyan University, at Bloomington, Ills., June 14th, 1870, by Rev. A. C. George, D.D., Editor of the "Weekly Mail."

THE POULTRY BULLETIN. Issued monthly, by the Executive Committee of the New York State Poultry Society.

THE CANADIAN POULTRY CHRONICLE, No. 1. Toronto: July, 1870.

PREMIUM LIST OF ILLINOIS STATE FAIR. Commencing September 26th, 1870.

ENTOMOLOGY INDEED RUN MAD!—Our friend, Mark Miller, in the last number of the *Pomologist* has an article devoted to THE Currant-worm. The article treats ostensibly of the Currant or Gooseberry Span-worm (*Ellopia ribearia,* Fitch), which is a true moth (Order *Lepidoptera*) indigenous to America; but, by way of illustration, we are treated to the figures of a fly and sundry worms, which—though the first, in the venation of the wings, is unlike anything God ever made, and the last might be taken for so many young alligators—are yet evidently intended to represent the Imported Currant-worm (*Nematus ventricosus,* Klug), which is a Hymenopterous importation from Europe, and of which not one word is said in the text. Is it any wonder that Economic Entomology is under-estimated, or that it makes slow progress, when such loose trash will pass muster with our leading horticultural journals? What would our readers think, if we were to expatiate upon the excellencies of the Red Currant, and, by way of illustration, should refer them to a bunch of Concord Grapes? Verily we are driven almost to distraction when we find such ignorance foisted on the public for knowledge. Mark Twain's first teachings as an agricultural editor are gospel compared to the reckless and undigested stuff that is sometimes spread before the agricultural reader, under the cloak of that much abused word, "practical!"

RED SPIDER.—The *ad interim* committee of the Illinois State Horticultural Society report great damage done, in the northern part of the State, by a new [?] *Acarus,* or Mite. We presume they have got hold of that most troublesome pest, the Red Spider (*Trombidium telarium,* Herm.), which is pale yellow when young. The young of most mites differ much from the adults, and many of them are 6-legged instead of 8-legged, as they afterwards become. This mite is always injurious during hot, dry weather, and a good rain will soon diminish its numbers.

☞ We frequently refer our readers to back numbers of our Journal, in order to save time and repetition. We cannot continually repeat what has already been written about some particular insect, and those who have not been subscribers from the start, or have not the numbers to which reference is made, would do well to send to the publishers for them.

☞ We learn with pleasure that our Southern correspondent, J. P. Stelle, has been appointed Entomologist to the Tennessee State Horticultural Society.

ANSWERS TO CORRESPONDENTS.

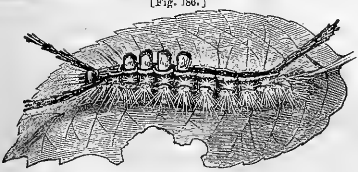
NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

Insects Named—*J. K. Kidd, Linwood, Mo.*—The two flattish beetles with dark brown wing-covers, and a yellow thorax having a central dark spot, are carrion eaters. There are several species, of which this *Silpha peltata*, Catesby, is the largest in the genus. They are related to the Burying-beetles (*Necrophila*), and feed almost invariably upon dead animal matter, though occasionally on rotten vegetables. The brilliant green and copper-colored beetle, which had destroyed all the caterpillars in a nest on a crab-apple tree, is the Rummaging Ground-beetle (*Colosoma scrutator*, Fabr.), a very predacious and useful insect, which we illustrated last month (Fig. 168). The large Two-winged Fly which had killed the Bumble-bee, and which so much resembles its victim in coloration, is the Yellow-necked Laphria (*Laphria thoracica*, Fabr.) We have here a curious instance of mimicry between a predacious Two-winged Fly (Order *Diptera*) and a honey-producing Four-winged Fly (Order *Hymenoptera*), which, no doubt, enables the former, by deception, to catch its prey with ease. Though these large predacious flies usually attack a great variety of other insects, we have reason to believe that the species in question confines its attacks in a great measure to bees of the *Bombus* Family, in which the black and yellow are the prevailing colors.

Caterpillar of White-marked Tussock Moth—*G. C. B. Lawrence, Kans.*—The caterpillars from a young apple tree are those of the White-marked Tus-

[Fig. 186.]



Colors—Black, white, yellow and red.

sock Moth (*Orgyia leucostigma*). We reproduce herewith (Fig. 186) an illustration taken from page 79 of our First Volume, where you will find some account of it. The male moth has curved pectinated antennæ, and a white spot on each front wing near the inner hind angle. It sits when in repose in the form of a delta, or rather of a heart of which the apex is at the head, and extends forwards its long, heavily clothed front feet to their full length. The female is wingless, like the same sex of the Canker-worm moth, and never leaves the cocoon from which she has emerged till her death, having previously deposited a great number of rounded white eggs, covered with a blanket of froth. In answer to your question, "will *Saperda bivittata* continue to exist if a tree dies during its stages of change?" it has been pretty satisfactorily proven that if it dies before it has arrived at the pupa stage, the insect perishes; but if the pupal condition is attained, it may develop into the beetle without hindrance. The Flat-headed Borer, however, continues to thrive on the dead wood for weeks after life has ceased in the tree.

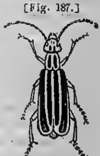
Does the Apple Curculio go underground to transform?—*Wm. Muir, Fox Creek, Mo.*—You wish to know whether the Apple Curculio ever attacks stone fruit, and whether its larva goes into the ground to transform, as stated by Dr. Hull. To the first question we reply emphatically "no," as we have never found it in stone fruit. To the second, we give it as our firm conviction that the larva never goes into the ground to transform. At all events, it never does when it infests the wild crab, as we have abundantly proved the present year; but in our own locality it is so scarce in tame apples that we have not yet been able to decide whether its habits when infesting the latter fruit are different, though we expect to do so before the end of the season, and have already taken proper steps towards deciding the point.

P. S.—Since the above was written we have heard from Mr. J. B. Miller, of Anna, Ills., to whom we sent for specimens of tame fruit that was infested, as we had learned that this insect was abundant in that vicinity. Upon cutting open the fruit, Mr. Miller found that it has the same habit of transforming within the tame fruit as we have found it to have in the wild crabs.

Walnut Caterpillars—*G. M. Levette, Indianapolis, Ind.*—The black worms with sparse white hairs, which have entirely stripped the Black Walnut trees around the State-house, though they have left untouched the other kinds, are the larvæ of the Hand-Maid Moth (*Datana ministra*, Drury). The habit which you noticed, of their descending and congregating in masses on the trunk of the tree, is characteristic of this and a few other species, and gives us a good opportunity to destroy them. There are two broods of this worm each year, the moths bred from the first worms appearing during July and depositing eggs which give birth to worms which go into the ground in the fall and hibernate in the pupa state.

Striped Blister Beetle—*Alex. Galt, Crescent Hill, Mo.*—The insects on your potato vines, and which you effectually killed by driving them into the fire, are the above-named beetle, of which we here reproduce a likeness (Fig. 187). It is not so abundant in Northern Illinois as in your present locality, and that is the reason you never noticed it there. The remedy you have applied will be found applicable to all the Blister-beetles that attack the Potato.

[Fig. 187.]

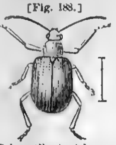


Colors—Black and yellow.

Parasite upon a Syrphus Larva—*B. D. Eastman, M.D., Washington, D. C.*—The little "capsule" which you found on a wild rose, is the puparium of a species of *Syrphus* fly; but in the present instance it had been stung when in the larva condition by a four-winged parasite, and the parasite having destroyed its host emerged in place of the true inhabitant. The subject of parasitism is extremely interesting, and opens a large field of study.

Grape-vine Fidia—*J. Hetzel, Bunker Hill, Ills.*—The chestnut-brown beetle on your grape-vines is the Grape-vine Fidia (*Fidia viticida*, Walsh, Fig. 188). It does much injury to the vines by riddling the leaves. Luckily this beetle has the same precautionary habit of dropping to the ground, upon the slightest disturbance, as has the Plum Curculio, and this habit enables us to keep it in check. The most efficient way of doing this is by the aid of chickens. The late Wm. Peschell, of Hermann, Mo., on whose vines this beetle had been exceedingly numerous, raised a large brood of chickens in 1867, and had them so well trained that all he had to do was to start them in the vineyard with a boy in front to shake the vines, and he himself behind the chicks. The chicks picked up every beetle which fell to the ground, and in this manner Mr. P. kept his vines so clean that he could scarcely find a single beetle in 1868.

[Fig. 188.]



Color—Chestnut-brown with a grayish pubescence.

Bee Nest—*J. R. Muhleman, Woodburn, Ills.*—The small bee spoken of on page 214, which we supposed might produce *Ceratina dupla*, Say, produced in reality *Prosopis affinis*, Smith. The species was kindly determined by Mr. E. T. Cresson, and you will find the original description in Mr. Smith's Catalogue of Hymenoptera in the British Museum, part I, page 24.

Some Interesting Insects—*A. S. Fuller, Ridgewood, N. J.*—You have our thanks for your numerous kindnesses. The following condensed answers should have been published last month: [1] The weevil in Lima beans, which you suppose to be the imported *Bruchus granarius*, are not that insect, but a native species (*Bruchus obsoletus*, Say) which we have several times referred to, and which is doing much damage to beans in various parts of the country. [2.] The ear of flint corn was infested by the larva of the Angoumois Grain Moth (*Butalis cerealella*,* Oliv.), of which you will find a full account in Harris, and in Fitch's Seventh Report. We have bred many moths from it. [3.] The large moth of a beautiful yellow color, sprinkled and marked with purple-brown, is the Imperial Dryocampa (*Dryocampa imperialis*, Drury). [4.] The brown worms which fold the leaves of the Hickory together by a tortuous silken case, were dead on arrival, and are new to us. We have bred from similar hickory cases a phytophagic variety of *Phycita nebulo*, Walsh. [5.] The smooth, narrow-cylindrical galls, 0.10—0.15 inch long, of a straw color, and inserted in a rough socket, which galls you find on the underside of hickory leaves, are the Tubular Hickory gall (*Cecidomyia tubicolæ*, O. S.), and are produced by a gall-gnat. [6.] The blackberry borer which arrived during our absence, and was dried up, was evidently the larva of the common species or Three-spotted Blackberry Borer (*Oberea tripunctata*, Fabr.) [7.] The worms which you think cause what is popularly termed "going blind" in the blossoms of the Blackberry, were dead and dry upon reaching us; but one solitary moth had issued from a pupa in the quill, and though damaged was readily recognized as the notorious Grapeberry Moth (*Lobesia botrana*) referred to on page 273 of our last number.

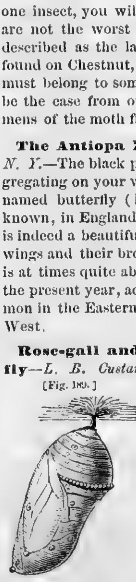
* Clemens referred this moth to the genus *Gelechia*. (Proc. Acad. Nat. Sci. Phil., 1860, p. 162.)

The Green Hag-Moth—*S. B. Shaw, Glendale, Mo.*—The pretty little moth with the abdomen and hind wings fulvous, and with the thorax and front wings delicate green, the latter bordered posteriorly with brown, and having a patch of the same color at base, one-third as long and one-half as wide as the wing itself, is *Callochlora viridis*, Reakirt. Its larva feeds on Cherry and Apple, and is of a bright scarlet color, with four dark blue-black lines along the back, and with prickly yellow horns or tubercles, which have the power of stinging. This moth was originally described by Mr. T. Reakirt by the name of *Limacodes viridus*, and subsequently as *Parasa viride*. Dr. A. S. Packard, Jr., afterwards described it as *Callochlora vernata*, erecting the genus for this species alone. Reakirt's specific name has the priority, and our little moth must consequently be known as *Callochlora viridis*. Synonyms enough for one insect, you will exclaim! Yes, but the synonyms are not the worst of it; for Mr. Reakirt has briefly described as the larva of our moth a worm which he found on Chestnut, and which has no relation to it, but must belong to some other species. We know this to be the case from ourselves having bred several specimens of the moth from the larva state.

The Antiopa Butterfly—*A. S. Moss, Fredonia, N. Y.*—The black prickly worms which have been congregating on your willows, are the larvæ of the above-named butterfly (*Vanessa antiopa*, Linn.), otherwise known, in England, as the "Camberwell Beauty." It is indeed a beautiful insect, with its rich purple-brown wings and their broad buff-yellow border. This insect is at times quite abundant, at others quite scarce; and the present year, according to accounts, it is quite common in the Eastern States, though rather scarce in the West.

Rose-gall and Pupa of Archippus Butterfly—*L. B. Custar, Logansport, Ind.*—The beautiful chrysalis (Fig. 189) found suspended to some oats, is that of the Archippus Butterfly. The small, round, yellowish galls on a rose leaf, covered with very short and blunt spines, instead of great prickles, as in that illustrated at Figure 192, are, we have every reason to believe, undescribed. Besides these two galls, we know of two other rose-leaf galls belonging to the same group, the one perfectly smooth, the other having something the form of a mangold-wurzel seed. All these galls agree in having thin shells, and containing a single larva; and they are doubtless all formed by gall-flies belonging to the genus *Rhodites*.

[Fig. 189.]



Colors—Green, black and gold.

White Grubs in Strawberry Beds—*J. B. Miller, Anna, Ills.*—The grubs in your strawberry beds, very much of the appearance of the common White Grub, but only half as large as that species when full grown, are, in all probability, the larvæ of the Immaculate Chafer (*Cycocephala immaculata*, Oliv.), a pale, yellow beetle, not quite one-half inch long, and having a dark head and two dusky points on the thorax. We have bred this species from similar grubs which occurred abundantly in a strawberry bed belonging to Mr. G. H. Baker, of your county.

Larva of the Thoas Swallow-tail—*E. H. Sprague.*—The worm which you send is rather rare in Missouri, and may be briefly described as of a mottled-brown color, and marked with pale grayish-white as follows: commencing in a band at sides of joint 1; running upwards and becoming less distinct to subdorsum of joint 4; occupying the back of joints 5, 6 and 7, reaching to proleg on joint 6, but only to subdorsum on 5 and 7, and occupying nearly the whole of joints 10, 11 and 12. This worm is the larva of the Thoas Swallow-tail (*Papilio thoas*, Linn.), our largest and most magnificent yellow and black butterfly. Its food-plant in the Southern States is the Orange tree; but you neither give your address nor (which we should like to know) the plant from which you took the worm.

Fungus on Wild Plums—*Subscriber, Pickens Station, Miss.*—The peculiar soft, yellow, pithy growth which we herewith illustrate, and which you find on a small Red Plum bush, is some kind of fungus. We find the same growth here during the month of June on the wild plum (*Prunus americana*). This fungus dries and blackens and remains on the tree through the winter. We shall leave its determination to fungologists, for the simple reason that we have no time to devote to this interesting part of Natural History.

[Fig. 190.]

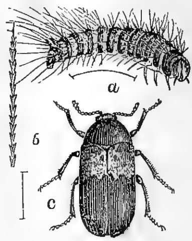
Color—Pale yellow when fresh, black when dry.

Larva of Clubbed Tortoise-beetle—*A. R. Bodley, Sturgis, Mich.*—The common Matrimony-vine is *Lycium vulgare*, and the Tortoise-beetles which you find upon it in company with their larvæ, are really the above-named species. The larvæ which you enclosed transformed on the way, and as we have never seen this larva, we should like other specimens. The Matrimony-vine belongs to the *Solanum* family, and your finding this insect upon it, furnishes additional proof that, while all other known Tortoise-beetles which have very flat larva (genera *Cassida, Coptocycla* and *Deloyala*) feed on plants belonging to the *Convolvulus* family, this species is exceptional, and feeds exclusively on such as belong to the *Solanum* family.

The Banded Ips in Calyx of Pear—*G. C. B.*—The small, shiny black beetle with two orange bands, interrupted along the back, on the wing-covers, is *Ips fasciatus*, Oliv. The fact of your finding them cutting their way into a pear, and eating into the calyx, is new and interesting. It is perfectly in accordance with the habits of the genus, however, for these beetles attack vegetable growths, though they most often confine their attacks to the funguses or to decaying vegetation.

The Larder-Beetle—*F. S. Sleeper, Galesburg, Mich.*—The brown hairy worms which have so ruined your collections of *Lepidoptera* are the larvæ of the Larder Beetle (*Dermestes lardarius*). It is a grievous pest to all sorts of preserved animals, and will soon ruin them when not well cared for. If you had constantly watched your collection, and examined the butterflies whenever you noticed any powdery excrement at the bottom of your boxes, you would never have lost a specimen. That our readers may recognize this destructive beetle, we present at Figure 191 enlarged drawings of its larva (*a*), one of the larval hairs, showing its peculiar formation (*b*), and the beetle (*c*).

[Fig. 191.]



Colors—(*a*) brown; (*c*) dark-brown and pale yellowish-brown.

Moth named—*E. M. Hale, Chicago, Ills.*—The pretty blackish moth, with the head above, prothorax beneath and tegulæ in front orange, and with the thorax and abdomen dark metallic-blue, is *Ctenucha latreillana*, Kirby, an insect which has been unusually common the present year in this vicinity.

The Little Cicada—*G. O. Hardeman, Summit, Mo.*—The small *Cicada* collected by you some time ago on the prairie, is a variety of *C. parvula*, Say, as kindly determined by Mr. Uhler, of Baltimore. It differs slightly from Say's description, and we were a little puzzled with it. It is widely distributed, and occurs more especially on the low grounds.

The Brown Mantispian—*G. C. B.*—Your insect, which "plays so curiously with his hands," and looks not unlike a miniature Camel-cricket, is the *Mantispa brunnea* of Say. It is one of our most common species, and being predacious, is, of course, beneficial. The green Tiger-beetle is *Tetracha virginica*. (A. E., I, Fig. 45.)

Golden Tortoise-beetle on Gooseberry—*W. T. Bell, Franklin, Pa.*—The pretty golden beetle which you found on a gooseberry leaf, is the above-named insect (*Cassida aurichalcea*, Fabr., A. E., 1, Fig. 178, *a*). It doubtless wandered on to the gooseberry leaf from some other plant belonging to the *Convolvulus* family.

Small Reddish Snout-beetle on Apple—*Jas. Weed, Muscatine, Iowa.*—The small reddish or rufous snout-beetle, only 0.10 inch long, and distinguished principally by a line of white hairs, more or less conspicuous, extending from the white scutel to the head, is the Thorn Anthonomus (*A. cratægi*, Walsh*), a species which breeds in many different galls made by either Plant-lice, Saw-flies, or Gall-gnats. From the fact that you found it with its snout fully imbedded in an apple, it perhaps breeds in this fruit also. It is not a small Four-humped curculio. No insects change or grow after once arriving at the perfect or imago state.

*P. E. S. P., VI, p. 266.

Spotted Pelidnota; Error regarding it—*J. D. Gros, Darien Centre, N. Y.*—Your beetle is the Spotted Pelidnota, of which you will find a full account in the present number. The little bronze-colored ciliated eggs are those of a true bug (*Heteroptera*), and you are entirely mistaken in supposing them to be the eggs of this beetle. No beetle is ever hatched from the egg a perfect beetle, any more than a bird is hatched perfect and full fledged from its egg.

Prickly Rose Gall—*Subscriber, Pickens Sta., Miss.*—The pretty little prickly galls which you found on a wild rose, and which we illustrate herewith (Fig. 192), may be appropriately known in popular language as the Prickly Rose-gall. It is made by a rather large gall-fly (*Rhodites bicolor*, Harr.) which has a black and rough-punctured head and thorax, and a smooth, highly polished, brownish-red body. The color of the gall varies with its age; the young gall often being of a beautiful rose-color, and reminding one of a strawberry, the mature gall being more generally green, and the old last year's galls being dull silvery-gray.

[Fig 192.]

Color—Either green or rose-color.

Questions answered—*K. Parsons, Cambridge, Mass.*—The small case found on your sister's dress was, so far as we could make out, that of some clothes moth. The Clothes moths, and many of those moths which live upon vegetable substances, construct a tubular dwelling of the material on which they feed, and drag it about with them during the larva stage; in most cases it serves also as a cocoon for the final transformations. Only one larva inhabits each case. The cocoons attached to the skin of the caterpillar you send are those of a parasitic *Microgaster*. The insects on the hawthorn twig are the common Oyster-shell Bark-louse. The young, when first hatched from the egg, are minute whitish, oval, six-footed creatures, very active, and scarcely visible without the aid of a microscope. As they remain active but a few days before fixing themselves to the bark, they should be attacked as soon as hatched. Ants frequently vary their diet with soft and helpless or disabled insects.

Hog-caterpillar of the Vine infested with Parasites—*J. M. Wilson, Sterling, Ills.*—Your Grapevine worm is the above-named species (*Charocampa pampinatrix*), and the little white cocoons are those of the same little *Microgaster* referred to and illustrated at Figure 15 of this volume.

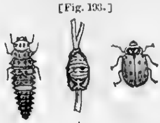
Larva of Abbot Sphinx—*S. E. Todd, New York.*—The worm which you found on your grapevines, and which measured nearly four and a half inches in length, is the larva of the Abbot Sphinx (*Thyreus Abbotii*, A. E., II, Fig. 84). The catch-'em-and-kill-'em remedy is the best you can adopt in this instance.

Cecropia Worm—*E. G. Hofman, St. Louis, Mo.*—Your worm on Plum is the Cecropia worm (Fig. 62 of this volume).

Flat-headed Borer in Soft Maples—*L. R. Elliott, Manhattan, Kans.*—The hammer-headed borers which you send, and which had killed a fine Soft Maple tree, are the Flat-headed Apple-tree Borer (*Chrysobothris femorata*, Fabr.) This insect is greatly damaging the Soft Maples in many of our Western towns, and unless precautions are taken to prevent such a catastrophe, this fine tree will soon be as badly injured all over the country as the Black Locust has been by its borer (*Arhopalus robiniæ*). We wish we could whisper into the ear of every man who plants a Soft Maple, that unless he thoroughly soaps the trunk and larger branches once or twice every summer, his tree will not last probably more than half a dozen years. We notice this beautiful shade tree dying wherever we go, when a little knowledge of these "contemptible bugs" would have enabled their owners to save them. Two applications of soap during the year—the one as early as the beginning of May, the other any time during summer—will protect the trees from its attacks. Be careful also not to bruise or injure the bark in any way.

Cherry Plant-lice and their Foes—*C. H. Roberts, Poughkeepsie, N. Y.*—The Plant-lice on the cherry trees are the above-named species (*Aphis cerasi*, Linn.) The maggots "of beautiful colors" which feed with such gluttony on these lice are the larvæ of some Syrphus-fly; and the darker, more active larva, is that of the Convergent Lady-bird (*Hippodamia convergens*, Gu.), which we illustrate herewith (Fig. 193), *a* showing the larva, *b* the pupa, and *c* the beetle. Both these last insects are very useful in destroying the plant-lice, and both pass through their transformations on or near the place where the larva is found. The *Syrphus* pupa is attached by the whole length of the under surface, while that of the lady-bird hangs by the tail from the bark or leaf of the tree.

[Fig. 193.]



a *b* *c*

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

Grape-vine Flea-beetle—The steel-blue beetle which has done so much damage to your vines is the above-named insect (*Haltica chalybea*, Ill.) The brown "slugs" or "worms" accompanying them are the young of the same. It is probably the Grape-vine Saw-fly (*Selandria vitis*, Harris) in the larva state, that you allude to as having a tadpole form. Harris recommends lime dusted on the leaves; also a wash of one pound of hard soap to five gallons water—*i. e.*, strong soapsuds.

Blood Sucker and Pear Slug—*Geo. A. Watson, Maysville, Ky.*—The black bug, of which you once found a specimen, gorged with your own blood, under a mattress, was too much mutilated to be recognizable, though we can tell you with certainty that it belongs to the great *Reduvius* family. The fragments seem to belong to the Black Corsair (*Pirates picipes*, H. Sch.), the beak of which we know to be very sharp and poisonous. All bugs are suckers either of the juices of plants or of the fluids of animals, and many species vary their diet at will. Instances are frequent of bugs, whose ordinary food is of a vegetable character, piercing and sucking the blood of human beings.

The Pear slug (*Selandria cerasi*, Peck) is easily destroyed by dusting the trees with lime. Coal oil will injure the tree. Strong soapsuds will be useful, but slacked lime is better.

Botanical Department.

DR. GEORGE VASEY, EDITOR, Richview, Ills.

FOXGLOVE PENTSTEMON.

(*Pentstemon Digitalis*, Nutt.)

The genus *Pentstemon* is, in North America, an extensive one, comprising, according to Dr. Gray's Synopsis of this genus (Proc. Am. Acad. Arts and Sciences, Phila., 1862), over sixty species; vastly the larger portion of which are inhabitants of the country west of the Mississippi river.

One species only (*Pentstemon pubescens*) extends over all the region east of the Mississippi; one species (*Pentstemon dissectus*, Ell.) characterized by pinnately-parted leaves, occurs only in the Southern States from Georgia to Florida; one species (*Pentstemon grandiflorus*, Nutt.), though most abundant west of the Mississippi, reaches over sparingly into Wisconsin and Illinois; and one other species (*P. Digitalis*, Nutt.) the subject of our present sketch, extends from Illinois to Arkansas, Louisiana and Georgia. The remaining species are variously distributed through California, New Mexico and the Rocky Mountain region.

[Fig. 194.]

Foxglove Pentstemon (*Pentstemon Digitalis*, Nutt.)

This is one of our handsomest native ornamental plants, growing, in favorable localities, three to four feet high. The stem is smooth, unbranched below, with four or five pairs of large leaves at intervals of five or six inches, the upper half forming a panicle of flowers, by the development of a pair of branches from each of the upper pairs of leaves, the leaves becoming smaller and the spaces shorter to the top. The flower stalks, or branches, are a little longer than the leaves, terminated by the clusters of flowers.

The engraving represents their form and appearance, a little less than the natural size. The plant belongs to the Natural Order *Scrophulariaceæ*, to which also belongs the European Foxglove (*Digitalis*), from a resemblance to which our plant has received its specific name. The flowers are a little less than an inch long, white, with a few faint lines of light purple. The leaves are ovate-lanceolate, finely toothed, from three to six inches long, and clasping the stem. The plant is perennial and showy, and would make a good appearance in the garden.

A NEW AND PECULIAR FORM OF HEUCHERA.

We promised, in the July number, to give, this month, an account of a peculiar species or form of Alum-root (*Heuchera*) from Southern Illinois. We sent a specimen of this plant to Dr. Gray, who considers it a form or variety of *Heuchera villosa*, Michx. He says that Buckley years ago gave it a name, and that it was also distributed years ago in Rugel's sets of plants, and distinguished and named by Shuttleworth as *Heuchera Rugellii*. The specimens as they came to us present very great differences from *H. villosa*. We hope it may be attentively watched by botanists in whose region it may be likely to occur—for instance in Kentucky and Tennessee. We give below a description of its prominent characters:

Heuchera villosa, Michx. (?) variety; *H. Rugellii*, Shuttleworth.—Scapes slender, somewhat declining, 6 to 10 inches long, about equaling the leaves; raceme loose, oblong, 3 to 4 inches long of 6 to 8 branches; peduncles almost filiform, each with 3 to 6 small flowers; upper bracts very small, laciniate; petals oblong-spatulate, tapering into a long claw; calyx somewhat turbinate; sepals obtuse; stamens about equaling the petals; beaks of the pods recurved at maturity; leaves reniform, about 3 inches long by 4 wide, with about 5 principal rounded lobes, teeth coarse, rounded, with an abrupt point; petioles villous, with glandular whitish hairs; leaf thin, roughish, with scattered hairs. Shaded Cliffs, Makanda, Ill., July. —*S. A. Forbes.*

COTTONWOOD—WHICH IS IT.

Populus monilifera or *Populus angulata ?*

Dr. J. G. Cooper, in his Report, in Vol. XII of the Pacific Railroad Survey in Oregon, says:

"Two, and perhaps more, species of Poplar form the forest growth on the inundated river banks, from an elevation of 5000 feet down to tide-water. They are also found on all the rivers running from the Rocky Mountains, and perhaps entirely across the continent. One of these is the Cottonwood (*Populus monilifera*); the other is distinguished as 'Balsam,' or 'Bitter Poplar,' it is peculiar to the western half of the continent (*Populus angustifolia*). The wood of both is of little value, but they grow rapidly and are ornamental. The islands and low shores of the Columbia are covered with these trees, of larger size than I have ever seen them elsewhere."

Dr. J. M. Bigelow, in Vol. XIV of the Reports, says:

"POPULUS MONILIFERA—COTTONWOOD—POPLAR.—This tree is somewhat different from the Cottonwood of the Mississippi, which I believe is *P. angulata*. It is found east as far as the Canadian river, and West until we cross the Sierra Nevada. In the Rio Grand valley it is used by the Mexicans for building. It is also employed for farming utensils, the most unique of which is their cart, the wheels being made of a section of this tree. They are six or eight inches thick, and manufactured in the rudest manner. The timber is tough and hard. It does not grow here as tall as on the Mississippi river, but occasionally it is quite large and spreading."

Dr. John Torrey, in his report on the plants of California and New Mexico, collected in the expedition commanded by Captain Williamson (Report, Vol. IX), says:

"*Populus monilifera*, Ait.—This is the common Cottonwood, which has a range from the Atlantic to the great Colorado, and almost as great an extent of latitude. It is abundant in some places near Fort Yuma."

Dr. James, in Long's Expedition to the Rocky Mountains, says:

"As far as our observation has extended, the Poplar most common in the country of the Mississippi, and indeed almost the only one which occurs, is the *Populus angulata*. This tree is perhaps as widely distributed as any indigenous to North America, extending at least from Canada to Louisiana, and from the Atlantic to the lower part of the Columbia river."

A QUESTION.—The northern limits of southern plants and the southern limits of northern plants should be carefully noted. There are three northern plants found as far south as Peoria, viz., *Arctostaphylos uva-ursi*, Spreng., *Menyanthes trifoliata*, Linn., and *Salix myrtilloides*, L. (*S. pedicellaris*, Pursh.) Where are the southern limits of these plants in Illinois? F. BRENDEL.

OUR NATIVE OAKS.—No. 3.

[Fig. 195.]

Willow Oak (*Quercus Phillos*, L.)

We would say with respect to the figures given of the Oaks, that we have only aimed to present correct average outlines, as an aid, through the eye, to a clearer conception of the differences between the species. As to nervation, surface of leaf, &c., we have not attempted precision. The form of leaf in different species varies so much that our space forbids a full illustration.

We propose in this paper to notice some of the biennial fruited Oaks. First, in that division we have the entire or willow-leaved species. In the eastern portion of the United States there are of this section three species. 1. The upland Willow Oak (*Quercus cinerea*, Michx.) This is a shrub or small tree, ranging from five to twenty feet high, growing in sandy pine barrens from Eastern Virginia through the Southern States, becoming very abundant in Mississippi. The leaves are from 1½ to 2 inches long, thick, shining, oblong, on young shoots sometimes toothed, and hanging long on the tree, but not evergreen except far south. They are bristle-pointed, downy on the under surface, with the edge or margin somewhat rolled back. The acorn is roundish, about half an inch long, the cup shallow and very short stalked.

2. The Willow Oak (*Quercus phillos*, L.) This is a large tree growing in low swampy

ground from New Jersey to Florida and westward, being probably most abundant in North and South Carolina. It varies in height from 30 to 60 feet, with a straight trunk, and a smooth thick bark. The leaves, as the name indicates, resemble those of the willow, being narrowly lanceolate, three to four inches long, very smooth and deciduous. The acorns are small and roundish. The timber is coarse grained, and of little value.

[Fig. 196.]

Laurel or Shingle Oak (*Quercus imbricaria*, Michx.)

3. The Shingle Oak (*Quercus imbricaria*, Mx.) This is a tree of moderate size, with a roundish dense head, smoothish black bark, leaves four to five inches long, thick and shining, oblong or lance oblong, acute pointed, with a very short petiole, sometimes slightly wavy on the margin, but not toothed, and the under surface downy when young. The acorn is roundish, small, half an inch long, the cup shallow and enclosing about one-fourth of the acorn. This tree is quite common in some parts of the Western States, becoming more abundant farther south, and reaching west to the headwaters of the Arkansas river. Its wood is of little value, making even poor shingles. It is known in different localities by different names, as Laurel Oak, Pin Oak, Black Jack, and Shingle Oak.

A form or variety of Oak which has been considered a hybrid, has been known in a few localities for many years as *Quercus Leana*. A description of this tree, by Dr. F. Brendel, in whose vicinity it grows, will be found at the close of this article.

[Fig. 197.]

Water Oak (*Quercus aquatica*, Catesby).

4. The Water Oak (*Quercus aquatica*, Catesby.) This tree is a native of the Southern States. It grows from 40 to 60 feet high, the wood is tough, the bark smooth, or in the old trees slightly furrowed. The leaves are very peculiar in form, being somewhat wedge-shaped, or rather with a long and narrow wedge-shaped base, expanded at the top into a somewhat three-lobed, obovate summit. They are smooth and shining, about three inches long, and the summit one to one and a half inches broad. The acorn is about half an inch long, cup shallow, half an inch broad.

5. Black Jack, or Jack Oak (*Q. nigra*, Linn., Willd.) A small sized tree from 15 to 25 or 30 feet high, with thick, rough, black bark, growing mostly in thin, poor soil, usually forming a dense roundish head. The leaves are thick and leathery in texture, five or six inches long, expanding at the top into about three broad, bristle-pointed lobes, gradually narrowed below, and ending in a rounded base, with very short petiole—they are covered with a rusty down on the under surface, as is also the young twigs—the upper surface is shining and veiny.

The leaves are liable to much variation in size and shape, in some cases the lobes being only marked by gentle undulations, in others by sharp and deep notches. The acorn is short and ovoid, and nearly half covered by the rough-scaled cup.

[Fig. 198.]

Black Jack (*Quercus nigra*, L.)

A LIST OF PLANTS

GROWING IN THE VICINITY OF CHICAGO DURING MARCH, APRIL AND MAY.

BY H. A. WARNE.

The district around Chicago might seem to one not personally acquainted with the country as a poor one for botanical collection, consisting mainly, as it does, of flat prairie; but our city botanists familiar with the region, have found it quite fruitful in species.

Taking the city as a centre, within the area of a circle swept by a radius of thirty miles, I am inclined to think a greater variety of plants may be collected than within the same space in any other portion of this State. In the barren sandy soil along Lake Michigan we find plants suggestive of the sea shore, including a number of species limited elsewhere to the Atlantic coast, or the neighborhood of saline deposits in the interior. Passing to the prairie within five or six miles of the city, along the lines of several railroads, where a strip of land has been rescued from tillage and protected from cattle, we may still find the distinctive plants of the prairie in rich profusion. This is peculiarly true of Graceland and Hyde Park suburbs.

For the species belonging to the woods and the moist river region we have our choice of following up the north branch of Chicago river, or at a somewhat greater distance, the course of the Des Plaines. A day's trip to Glencoe takes us to deep ravines with their appropriate plants; while an excursion to Lake Calumet, or the adjoining county of Lake, brings us to a local flora of much interest; in the latter case the plants are associated with evergreens.

Within such an area we might reasonably expect to find a varied vegetation. Our season here opens rather late compared with other sections, but advances with rapid strides after the middle of April.

My list for March includes only that odd plant the Skunk Cabbage (*Symplocarpus fœtidus*), whose variegated spathes, just thrust above ground, suggest at once the tulip and some fleshy fungus. This abounds in swampy localities north of the city, and along the Des Plaines river. It is our first spring flower, but to my surprise last fall, just as the Gentians were putting in an appearance, I found a solitary purple and green spathe of this plant. What abnormal condition caused this unusual blossoming I am unable to decide. It is paralleled in my own observation, however, by the appearance in autumn of the flowers of *Viola pedata*. In such plants the flower buds are so far advanced at the close of autumn as to yield to the first touches of spring, so that but little stimulus of a certain character starts them into bloom. Autumnal impulses may thus occasionally anticipate those of spring. The Hepatica and May flower (*Epigea*) may doubtless be found in bloom under similar circumstances with any of the stemless violets. April ushered in the Prickly Ash (*Zanthoxylum Americana*), its yellowish-green flowers clustered on the bare and prickly twigs, in the river district; while along the lake shore the low shrubs of the aromatic Sumac (*Rhus aromatica*) displayed thin yellow spikes of blossoms. I noticed that the lower branches lying on the sand bloomed a week earlier than the upper ones, the warming up of the sand doubtless being the cause.

The country a few miles back from Lake Michigan, especially in the region of the Des Plaines river, has an earlier season than the lake shore by a week or ten days. Here were found about the middle of April *Hepatica triloba*, var. *acutiloba*, Blood-root (*Sanguinaria Canadensis*), the white Dog-tooth Violet (*Erythronium albidum*), the Rue Anemone (*Thalictrum anemonoides*), *Dicentra cucullaria* and *Claytonia Virginica*. Old collectors report *Isopyrum biter-*

ernatum from this region. We may add to our list also the following, collected May 1st at Graceland suburb, a few miles north of the city: Of Violets, four species, viz., *Viola cucullata*, *V. blanda*, *V. pedata*, and *V. sagittata*; Marsh Marigold (*Caltha palustris*), *Ranunculus fascicularis*, the Wood Anemone (*A. nemorosa*), *Phlox bifida*, *Antennaria plantaginifolia*, *Arabis lyrata*, *Cardamine rhomboidea*, var. *purpurea*, and *Trillium cernuum*. A week later were found *Uvularia grandiflora*, and *Polemonium reptans*; and at Hyde Park suburb, the American Cowslip (*Dodecatheon meadia*), the Hoary Stone-seed (*Lithospermum canescens*), the Larkspur Violet, (*Viola delphinifolia*), the Lance-leaved Violet (*V. lanceolata*), the wild Lupine (*Lupinus perennis*), Wood Rue (*Thalictrum dioicum*), and Yellow Star-grass (*Hypoxis erecta*).

Along the lake shore here the Bearberry (*Arctostaphylos uva-ursi*) was beginning to bloom, but to our disgust was speedily scorched and blackened by a fire kindled on the shore by some vandals.

Valeriana edulis was found in an old fenced field hereabout in the greatest abundance, the plants apparently of great age, forming solid woody clumps, half a foot in diameter. The great abundance of this plant here, though sparingly found elsewhere, almost seriously suggested the notion of cultivation by the Indians in time past. The white Lady's Slipper (*Cypripedium candidum*) seems to find a congenial home in association with this plant, for a week later over a hundred specimens were collected in this field. Like its companion, it is not common, but occurs abundantly in a few places.

A trip to the rich wooded district along the north branch of Chicago river about May 15th was quite fruitful, yielding the following species: *Ranunculus abortivus*, *Viola pubescens* (a form with remarkably large and beautiful flowers), *Dentaria laciniata*, the Creeping Crow-foot (*Ranunculus repens*), wild Turnip (*Arisæma triphyllum*), *Trillium recurvatum*, Blue Cohosh (*Caulophyllum thalictroides*), Red Cohosh (*Actea spicata*), Feverwort (*Triosteum perfoliatum*), wild Geranium (*Geranium maculatum*), wild Gooseberry (*Ribes hirtellum*), wild Black Currant (*Ribes floridum*), May Apple (*Podophyllum peltatum*), Five-finger (*Potentilla Canadensis*), wild Ginger (*Asarum Canadensis*), Scarlet Thorn (*Crategus coccinea*), Black Thorn (*C. tomentosa*), wild Crab Apple (*Pyrus coronaria*), Shad-bush (*Amelanchier Canadensis*), wild Plum (*Prunus Americana*), wild Black Cherry (*P. serotina*), Bur Oak (*Quercus macrocarpa*), White Oak (*Q. alba*), Red Oak (*Q. tinctoria*), Red Elm (*Ulmus fulva*, in fruit), Blueberry (*Vaccinium Pennsylvanicum*), Black Huckleberry (*Gaylussacia resinosa*), with that little oddity, the False Mermaid (*Floerka proserpinacoides*), in great abundance.

The procession of the flowers from this date to the close of May this season was astonishingly rapid, fully ten days in advance of the usual time. At Calumet, fourteen miles from the city, we found the delicate Bluets (*Houstonia cerulea*) and Sweet Fern (*Comptonia asplenifolia*). This peculiar locality affords rarities throughout the season; while Glencoe, a somewhat distant collecting ground, yields us now the Buffalo-bush (*Shepherdia Canadensis*). Along the lake shore we find on sandy hillocks two species of Prunus in bloom, the Choke Cherry (*P. Virginiana*), and the Sand Cherry (*P. pumila*). The shrubs of the latter are apparently very old, and of remarkable size for the species, some being from *three* to *four feet* in height. The Dwarf Birch (*Betula pumila*), is now to be found sparingly in the region of Rose Hill suburbs.

An excursion to Hyde Park (May 29th) afforded, among other things, Golden Alexanders (*Zizia integerrima*) and *Thaspium aureum*, a handsome wild Coreopsis (*Coreopsis lanceolata*), the large Yellow Lady's Slipper (*Cypripedium pubescens*), Blue-flag (*Iris versicolor*), Cynthia Virginica, the Painted Cup (*Castilleia coccinea*), yellow and scarlet varieties, Spider-lily (*Tradescantia Virginica*), Large Alum-root (*Heuchera hispida*), Marsh Pea (*Lathyrus palustris*), Beach Pea (*L. maritimus*), and wild Columbine (*Aquilegia Canadensis*). The beautiful little *Collinsia verna* has been collected at the Des Plaines river.

In several excursions during the latter part of May the following were collected: In fruit, the Witch Hazel (*Hamamelis Virginica*), unexpectedly found near the city. In flower, at the same locality, the High Cranberry-bush (*Viburnum opulus*), supposed to be the original of the Snow-ball of the gardens, the Sweet Viburnum (*V. lentago*), and wild Sarsaparilla (*Aralia nudicaulis*). To this list we will only add the wild Indigo plant (*Baptisia leucophea*), wild Hyacinth (*Scilla Fraseri*), Water Crow-foot (*Ranunculus multifidus*), Seneca Snake-root (*Polygala Senega*), Maple-leaved Viburnum (*V. acerifolium*), Small-flowered Honey-suckle (*Lonicera parviflora*), and the Small-flowered Lady's Slipper (*Cypripedium parviflorum*).

BOTANICAL MISCELLANY.

At a meeting of the Philadelphia Academy of Sciences, Mr. Thomas Meehan said that "no one who examined the prevailing theories concerning the formation of bark and wood with numerous living specimens before him, could be satisfied that these theories were in all respects correct. He had made numerous observations during the past year, which satisfied him that at any rate we had much to learn. He hoped to present these observations to the members at some future time, but at present wished only to direct their attention to a portion of a trunk of *Yucca alœfolia*, which he exhibited, the structure of which, he suggested, could not be accounted for on any theory generally known. The general idea was that the sap of plants ascended through the system, and was elaborated in the leaves, where the woody matter was formed, and afterwards descended—in exogenous plants forming a regular concentric layer over the last year's wood, and in endogenous structures returning by the interior, pushing these descending columns of wood through the mass of cellular matter without order or system. It would be seen that in this endogenous *Yucca* the woody matter, if it ever descended at all, as our present belief demanded it should do, had descended in a very regular and beautiful manner; quite as systematic, in fact, as most exogens would do. The wood was arranged in annual rings, not entirely concentric, but some tropical exogens did not have the woody annual layers always forming an entire circle any more than in this. In this case the annual layers of wood extended about two-thirds of the distance round the axis, and such layer was about the eighth of an inch thick. These annual layers were made visible by the bundles of fibres being packed more closely together towards the end of the season's growth, just as they are in exogens, from which, indeed, there was very little to distinguish this structure on a cursory examination but the absence of the so-called medullary rays."

The active botanists of New York city have organized a botanical club, which they designate the Torrey Botanical Club, in honor of the distinguished New York botanist, Dr. John Torrey. The club publishes a monthly *Bulletin*, the object of which is "to form a medium of communication for all those interested in the flora of this vicinity, and thus to bring together and fan into a flame the sparks of botanical enthusiasm at present too much isolated." We hail the advent of every such society as an indication of a growing interest in Natural Science, and as a means of increasing the number of learners and observers, and of thus directing into worthy channels much otherwise misemployed time and talent. We select from the *Bulletin* a few items which we presume will be of interest to our readers.

Aristolochia serpentaria, L.—Mr. Wm. Bower has in his garden, in Newark, a plant of this species, which, beside the regular flower, sends up a number of small buds with flowers that do not open, somewhat in the manner of *Specularia perfoliata*, probably for self-fertilization. The same kind of flowers may be observed in the case of many well-grown wild plants of this species. These flowers, however, form perfect seed-pods. It would be interesting to examine whether *Asarum Canadense* has also two sorts of flowers. Mr. Bower was the first to call my attention to this peculiarity, and I cannot learn that it has ever been noticed before. Judging from the plants I have seen, it would appear that seeds in greater abundance, and perhaps more perfect, are produced by these hermaphrodite flowers. In the similar case of *Amphicarpæa monoica*, Nutt, I have found sometimes quite a number of pods with apparently well-formed seed. On the other hand *Apios tuberosa*, Mœnch, seems to compensate by its tubers for the very frequent abortion of its pods. These plants, with others, *Specularia* for example, afford an interesting subject for investigation on this point. W. H. L.

Flowering of the Darlingtonia.—Dr. Torrey kindly gave me, early last winter, one of the several specimens of *Darlingtonia*, which he received from a correspondent in California. An empty aquarium tank was converted into a small conservatory for it, and it was planted in a mixture of swamp mud and sphagnum, the top of the tank being covered with a glass plate. The plant was kept in a cold room, where the moss was slightly frozen several times during the winter. The plant flowered early in April, and the specimen was placed in the hands of Dr. Torrey, to allow him to confirm his original observations, made upon dry materials, and he will probably add what may be necessary to complete the history of this interesting plant. G. T.

We learn from a correspondent (Mr. John Williamson) that New Albany, Indiana, has a Society of Natural History which has about 200 members that pay their dues and are interested in its welfare. Geology, Entomology, Conchology, Botany, etc., are represented by gentlemen well posted in those various branches. We believe some gentlemen of Louisville, Ky., also intend organizing a society. Dr. E. S. Crozier, of that city, edits a column of Popular Science in the *Louisville Commercial.*

Errata.—Page 288, column 2, line 12, for '*Fraximus*" read "*Fraxinus;*" same column, line 22, for "apetatous" read "apetalous;" same column, line 23, for "*Acu*" read "*Acer.*"

DESCRIPTION OF QUERCUS LEANA.

BY DR. F. BRENDEL, PEORIA, ILL.

[Fig. 199.]

Quercus Leana, Nutt.

Quercus leana, Nutt, is a biennial fruited Oak, with deciduous leaves, which are obovate and mostly three-lobed at the apex, the lobes are bristle-pointed, tomentose when young, at last becoming nearly smooth. The fruit is short peduncled, single or in twos, the cup hemispherical, with a conical scaly base, half an inch wide; the acorn globular, half an inch long, about half immersed.

This Oak seems to be a hybrid between *Q. imbricaria* and *Q. coccinea;* the general appearance is that of the former; the leaves are nearly entire, but the texture is not so firm as in *Q. imbricaria,* and of the old ones both sides are glabrous, when in a young state they are more tomentose, so that on the upper side the nervation is often hardly visible, as in *Q. coccinea,* to which it approaches in the much smaller fruit, the cup being deeper than that of *Q. imbricaria,* the scales looser and more distinct; the acorn has at the apex a blunt conical knoll, which in *Q. imbricaria* is smaller projecting from a flat areola. The bud is ovate, conical, slightly five-ridged, and less tomentose than in *Q. coccinea,* whereas in *Q. imbricaria* it is more rounded and smooth.

A tree of this species in Hancock county has been known many years; besides it there are two others in Illinois: one in Fulton county and one near Peoria—the latter in the neighborhood of its supposed parents. From its similarity to *Q. imbricaria,* it is likely to be overlooked, and may perhaps yet be found in other places.

EUROPEAN CORRESPONDENCE.

We present our readers some extracts from a letter of Mrs. Kate N. Doggett, of Chicago, now in Europe. Mrs. Doggett is an enthusiastic Naturalist, and has made large collections in Botany and other departments of Natural History. There are hundreds of ladies in our large cities who have time and means to devote to mental cultivation and the acquirement of useful knowledge. How much refined pleasure these ladies might find in the study of Nature. An active and interesting Botanical Society has been in operation for some time past in Chicago, embracing not only professional men, but also several ladies who are heads of families, showing that even maternal cares do not necessarily interfere with continued mental culture. When shall we have Botanical Societies in all our large towns and cities which shall interest both ladies and gentlemen who have leisure for such pursuits? Why should ladies leave all systematic pursuit of education when they leave their schools? We hope the day will come when it will be *fashionable* for ladies to take an interest in societies for the promotion of science.

BRIENZ, SWITZERLAND, May 3d.

Your letter came to me just as we were leaving Tunis, and this is the first moment I have had to answer it. * * * As yet I have not been able to collect any sea-mosses, although we have been nearly all winter on the shores of the Mediterranean, but in towns where, of course, were no beaches; but very soon we go to the British Isles, and there I hope to do better. You are quite right in thinking I had not lost my interest in Botany. I do not believe that I shall do that till I lose my interest in life. A few months before we left home a half dozen persons formed themselves into a Botanical Society, doing me the honor to make me their president. When I left we numbered a dozen. Prof. Beal is the vice-president, and he is doing much in Chicago to interest his pupils in the study of Botany. * * * * We spent five weeks in the north of Africa, which is one grand flower garden, and wished we could lengthen the weeks into months. At Algiers we made the acquaintance of Signor Durande, an Italian, who has lived in Africa for twenty years, and has been one of the most important contributors to the "Botany of Algeria," now publishing by the French Government. But, like all works brought out by government, it progresses very slowly, and will be so expensive it will benefit but few. For years Mr. Durande has done what I would like to have you do, and what will, I think, do much to excite interest in the study of Natural History, particularly among women. Something akin to it was initiated long ago in Salem, by the Director of the Institute, and has been so successful that nearly every person in Salem knows something of Natural Science. One day in the week Mr. Durande makes an excursion to some place in the vicinity of Algiers, taking with him such students of the Medical College with which he is connected as choose to accompany him, and gentlemen and ladies living in the city or strangers sojourning there. We had the pleasure of joining two of these excursions; one to Blida, whither we went by rail, and one to Cape Matifou, to which we drove. Our party was made up of Danes, French, Germans, English and Americans. At Blida, one of the loveliest spots imaginable, perfectly embowered in orange groves, we explored the Botanical Garden (the like of which is not in all America, and you must recollect that so far as anything of this sort goes Algeria is but forty years old), several private gardens, and a wild ravine whose rocks were covered with mosses, ferns and lycopodia, Mr. Durande telling us names and explaining affinities, modes of culture, &c., &c., in the most charming way. At Cape Matifou we gathered flowers, one gentleman and lady collected shells, some sketched the ruins of the Roman city of Rusconia, which sent a bishop to the first Christian council; and we had a most enjoyable day, to say nothing of the profit we derived from the teachings of Sig. Durande, and the conversation of intelligent people from different parts of the world.

NOTES FROM CORRESPONDENTS.

A Natural Graft Hybrid of *Quercus alba* and *Q. tinctoria*.—I was recently informed of a remarkable "Indian graft of a Black Oak on a White Oak," in the neighborhood of Petersburg, Ill., and having the almost incredible story from good authority, I was induced to visit the locality to learn if it was really true. To my great regret I found the tree prostrated by a storm, apparently about two years ago, and the top principally hauled off for fuel, but that portion where the union was formed, and the smaller portions of the limbs of the hybrid were left on the ground. The story of the Indian graft I found to be current in the neighborhood, and numbers of people knew all about it. It appears that the union was formed in a portion of the top of the White Oak about fifty-five feet from the ground, and, judging from the layers of wood, about 75 years ago. It seems that the Black Oak (*Quercus tinctoria*, for such it really appeared to be) had fallen into the White Oak—as was evident from the remains of a decayed limb and the positions of growth—and had by some unaccountable means united with it, and had grown from the point of union a huge branching limb, more than twice the diameter of the limb of the White Oak upon which it was attached. No remains of a tree of *Quercus tinctoria* was now in reach of the White Oak upon which this remarkable graft was growing, and the most probable explanation of the *modus operandi* is that *Quercus tinctoria*, when falling, had dashed a rather large limb into the fork of the White Oak top with force enough to remove the bark from both species, and being so firmly pressed by the fork that a union was effected.

But what will most interest the botanist is, that the graft clearly shows hybridism. Of course no leaves could now be had, but the wood, bark and buds appear about equally to belong to both species, *Q. alba* showing strongly in the smaller limbs, and the rough bark of *Q. tinctoria* most fully developed at the point of union and grading to the smaller limbs, where it may be said to insensibly disappear. This interesting and remarkable production may be recorded as adding another to the few known graft hybrids in the vegetable kingdom.

ATHENS, Ills. E. HALL.

P. S.—Tell your correspondent, G. H. French, that I will "go the cider" that his remarkable tree (described in the June number) is the Kentucky Coffee tree (*Gymnocladus Canadensis*).

Botanical Notes.—MR. EDITOR: In complying with your request for botanical notes from this portion of the State, I will confine myself, for the present, to the counties of Union and Jackson—a region not less interesting to the botanist for the number and peculiarity of its species, than to the tourist for the beauty of its scenery.

It embraces a range of nearly 2,500 vertical feet of geological strata; and, as the drift formation is generally absent, the soil is made by decomposition of the underlying rocks, and varies widely in character according to the rocks from which it is formed and upon which it rests.

From the Mississippi bottoms upon its western border—but little above the level of the Ohio at Cairo—it rises to the Cobden hills, among the highest in the State; and its surface varies from the lagoons and swamps of the former to the rocky and precipitous bluffs of the hill country in the west. Its southerly situation gives it a genial climate, and the great comparative height to which portions of it are elevated protects them from late and early frosts. Consequently we find here an unusual variety of species, many of them not known elsewhere north of the Ohio river, and nearly all of them appearing from two to six weeks earlier than the dates given in Gray's Manual. In the small portion of these counties which I have been able to examine, I have observed—exclusive of forest trees, grasses, sedges and mosses—450 species, representing 290 genera and 90 orders.

The region may be conveniently divided, for the purposes of these notes, into the hills and bluffs, the creek bottoms, and the Mississippi bottoms, each of which has a more or less characteristic flora. Upon the first are chiefly found our ferns. Of these I have collected 25 species, including the *Polypodium incanum*, *Cystopteris fragilis*, *Cheilanthes vestita*, *Osmunda Claytoniana*, *Camptosorus rhizophyllus*, *Asplenium pinnatifidum*, *trichomanes* and *ebeneum*, *Aspidium Goldianum*, *Allosorus*, *Pteris*, etc. Of the last, a variety occurs quite frequently which is peculiar in lacking the ternate character of the frond. This variety has propagated itself without change for three years since I first observed it.

It is along the borders of the bluffs, however—which here repeat in miniature the cascades and precipices of mountain scenery—that we obtain the most interesting results. Here the soil is mostly shaded by the overhanging trees, warmed by the heat reflected from the rocks, and moistened by the dripping surface waters carried off by the underlying strata. In such places only have I found, at Cobden, the *Phacelia Purshii*, remarkable for the delicate beauty of its light-blue, deeply-fringed corolla, and at Makanda the *Mitchella repens*, which seems to flourish with us rather where it receives the constant drippings of the rocks than in dry woods, as farther east. Along the bluffs and upon the rocky hill-sides occurs also the *Azalea nudiflora*, described by Gray as growing in the eastern swamps. The profusion of light-pink blossoms which this shrub puts forth in early spring, lighting up the gloomy forests of the Pine Hills, or drooping in fragrant, cloud-like masses from the summit of the lofty cliffs, forms a feature of unusual beauty in the scenery of our opening year. Later in the season, the hill-sides are blue with the *Dipteracanthus strepens* and *D. ciliosus*, which remain in bloom until autumn, and in thickets the *Clitoria Mariana*, the largest of our leguminous flowers, is frequently met. The *Agave Virginica* and *Vaccinium arboreum* occur only among the dry hills, and the *V. vacillans*, with its pleasant fruit—erroneously called a huckleberry throughout the country—is quite common in the same situations. This last occurs especially among the Pine Hills, on the eastern borders of the Mississippi bottoms.

This region consists of a succession of sharp ridges of chirty limestone, separated by narrow, steep ravines; and frequently terminating, towards the river, in nearly vertical bluffs, from 100 to 500 feet in height. Its flora partakes to a great extent of its geological peculiarities, and many plants found sparingly elsewhere seem to have spread from these hills as a centre. Peculiar to them alone, so far as I have seen, is the Yellow Pine (*Pinus mitis*), found almost exclusively upon the summits and southern slopes of the ridges mentioned, the *Viola pedata*, *Verbena aubletia*, etc.

On the Makanda bluffs, which are frequently fringed with cedars, grows the *Corydalis aurea*, a *Saxifraga* resembling the *erosa*, but apparently not identical with it, and a *Heuchera* of a species unknown to me, specimens of which I sent you recently. Among others more widely scattered I might mention *Ascyrum crux-Andreæ*, *Sagina apetala*, *Rhus aromaticum*, *Trifolium reflexum* (which I have also found scattered in single stools through low woods in Franklin county), *Passiflora lutea* and *Physostegia Virginiana*. The Passion vine (*Passiflora incarnata*) has also been found upon the hills near Jonesboro, and grows readily in the open air. The *Physostegia* is one of the finest of our wild flowers—one of those "which no lady's garden should be without." In cultivation it grows three or four feet high, sending up a cluster of stout stems, each bearing a close, four-ranked, usually compound, spike, six or eight inches long by two or three in thickness. The flowers are a light rose-color, marked with purple spots, and when massed in bloom are notable for their light and airy elegance.

I will write you further of the lower lands and of the forest trees at another time. S. A. Forbes.

Pine Barren Plants.—Who, except a botanist, would ever dream of the hidden floral treasures to be found in the uninviting, dreary-looking pine barrens of New Jersey? The hills and rocks of New England, the fine woodlands of the middle and western States, and the rich prairies of the West, must all yield the palm to the despised pine barrens of New Jersey for rare and beautiful plants.

Years ago, every now and then a charming plant would reach me in my wanderings, labeled "pine barrens, N. J." Surely such exquisite flowers must come from some enchanted fairyland; but no, there was the unmistakable label, with the portentous word "pine barrens;" so my dream of fairyland vanished amid the white, dreary sand of South Jersey. Still, with each sight of these beautiful flowers would come a longing to visit the home of their birth.

My first excursion in the "barrens" was early in April, when, after a wearying march through brush and briers, in damp places, I suddenly came upon the little trailing evergreen, *Pyxidanthera barbulata*, Michx. This charming little plant is found in the natural Order *Diapensiaceæ*. Botanists give us only two plants in this order, and by many authors these two are made to form each a genus by itself. *Diapensia Lapponica*, L., is a little Alpine plant found in the north of Europe and in the northern parts of our own country; but our little pine-barren *Diapensia*, or, according to Gray and other authors, *Pyxidanthera*, is the one under consideration. It is so limited in its extent that it has never received a pet name, but no plant more deserves some common name suggestive of its rare loveliness.

True, I had received dried specimens of this plant, and thought it very pretty; but I was not prepared for the enchanting, graceful loveliness that rewarded me for my laborious search. It was growing in thick masses, studded all over among its numerous, tiny, bright green leaves with pinkish and white buds, with now and then a fully expanded blossom. It seemed like sacrilege to disturb it, hidden away as it was from human eyes, and called forcibly to mind Emerson's exquisite little poem, "Rhodora."

"In May, when sea-winds pierced our solitudes,
I found the fresh Rhodora in the woods,
Spreading its leafless bloom in a damp nook,
To please the desert and the sluggish brook.
The purple petals, fallen in the pool,
  Made the black water with their beauty gay;
Here might the Red-bird come his plumes to cool,
  And court the flower that cheapens his array.

"Rhodora! if the sages ask thee why
This charm is wasted on the earth and sky,
Tell them, dear, that if eyes were made for seeing,
Then beauty is its own excuse for being:
Why thou wert there, O rival of the rose!
  I never thought to ask—I never knew;
But, in my simple ignorance, suppose
  The self-same Power that brought me there brought you."

In April and May we find in most of the shallow ponds among the barrens a curious water plant, which, although it cannot be strictly called a pine barren plant, yet, from its limited extent and interesting character, requires a passing notice. Its scientific name is *Orontium aquaticum*, L., and it has received the very appropriate common name of Golden Club. It is found in the natural order *Araceæ*. The leaves are large, ten or twelve inches in length and about half as wide; the upper surface of the leaf is a light velvety green, the under surface much paler, and very smooth and shining, on long radical petioles; from the midst of these leaves arise several scapes, or flower-stalks, which, from the base up to within a few inches of the top, are of a dusky purplish color, which gradually fades into the purest white, terminating in a rich golden-yellow spadix, covered with small, perfect yellow flowers.

Leiophyllum buxifolium, Ell., is another charming pine-barren plant, and has received the characteristic common name of Sand Myrtle. It belongs to the order *Ericaceæ*, with our splendid Azaleas and Rhododendrons, which the European florists have coaxed into numberless varieties. Possibly this beautiful little shrub will be neglected by us until the European florists sell it back to us at high figures, as they already have many plants of this family.

The *Leiophyllum* is an evergreen shrub, with leaves small, dark green, very smooth and shining, and strung thickly along the stems, which in May are terminated with thick, umbel-like clusters of small white or pinkish flowers. Gray and other botanists give the height of this shrub at from eight to ten inches, and this is its usual height on the dry sandy barrens; but in Atlantic county, near the coast, in damp soil, I found an acre or more of this shrub with an average height of about three feet. I found it while in full bloom, and it stood so thick as to exclude almost everything else. It was surrounded by a thick, almost impenetrable, tangled mass of shrub-growth, bound together by the climbing prickly Smilax, through which I forced my way, and was more than repaid for my toil by the beautiful sight, which can never be effaced from my memory.

One of the most stately and beautiful pine-barren plants is *Xerophyllum asphodeloides*, Nutt. It is an Endogenous plant, and found in the order *Melanthaceæ*. The foliage consists of a thick tuft of grass-like leaves, from the midst of which arises a single flower-stalk, from three to four feet in height, bearing a dense raceme of showy white flowers. It is found in moist places, and commences blooming in May. Mr. Fuller, of *Hearth and Home*, remarked on first seeing this plant, that this alone was worth taking a trip from New York to see; and, florist as he is, this remark is a sufficient guarantee of its rare loveliness.

But I would not have the reader think that the pine barrens exclude the charming flowers of his acquaintance: From the latter part of March all through the month of April, the air is redolent with the sweet fragrance of the Trailing Arbutus (*Epigea repens*, L.), growing with a rich luxuriance in the white sand, with a simple mulching of oak and pine leaves. Also the delicate, early little Wind-flower (*Anemone nemorosa*, L.) is found in abundance, with the ever-present, aromatic Wintergreen (*Gaulthera procumbens*, L.), with its shining green leaves and bright scarlet berries. The little trailing Partridge vine (*Mitchella repens*, L.), with its scarlet twin berries—like the Wintergreen remaining on the plant all winter—greets us often in our early spring rambles. As the season advances so does the number of beautiful plants increase among the seemingly dreary pine barrens, of which I will try to make further report from time to time. MARY TREAT.

ANSWERS TO CORRESPONDENTS.

Plants to Name—*H. W. Patterson, Oquawka, Ills.*—No. 1, *Thaspium barbinode*, Nutt.; No. 2, *Glyceria nervata*, Trin.; No. 3, *Erigeron strigosum*, Muhl.; No. 4, *Carex Meadii*, Dew.; No. 5, *Œnothera fruticosa*, L.; No. 8, *Kœleria cristata*, Pers.; No. 9, *Panicum pauciflorum*, Ell.; No. 11, *Carex hystricina*, Willd.; No. 12, *Erigeron Philadelphicum*, L.; No. 13, *Cryptotænia Canadensis*, D. C ; No. 14, *Melica mutica*, Walt.; No. 21, *Hordeum pusillum*, Nutt.; No. 22, *Ptelea trifoliata*, L.; No. 27, *Hydrophyllum Virginicum*, L.; No. 28, *Osmorrhiza longistylis*, D. C.; No. 29, *Polytænia Nuttallii*, D. C.; No. 30, *Sanicula Canadensis*, L.

Huron Burt, Callaway, Mo.—No. 1, Annual Spear-grass (*Poa annua*, L.) This is probably an introduced grass—it seems to follow in the line of advancing civilization. It is too small to be productive as a meadow grass. Mr. C. L. Flint, author of a "Practical Treatise on Grasses," says: "This modest and beautiful grass flowers throughout the whole summer, and forms a very large part of the sward of New England pastures, producing an early and sweet feed exceedingly relished by cattle. It does not resist the drought very well, but becomes parched up in our pastures." It is called an annual, but comes up as you say in the fall from seed, ripens its seeds the ensuing summer and dies. No. 2, the common Rush-grass (*Juncus tenuis*, L.), very well characterized as "Wire-grass," and of little practical value. No. 3 is called Cleavers, or Goose-grass, (*Galium aparine*, L.) though not properly a grass, but a plant of the Madder family (*Rubiaceæ*). No. 4 is the omnipresent Knot-grass, or Goose-grass (*Polygonum aviculare*, L.), which everywhere takes possession of door-yards and paths, and thrives under the roughest treatment.

Geo. L. Bodley, Battle Creek, Mich.—The leaves you send are those of the Red Mulberry (*Morus rubra*, L.) On mature trees the leaves are seldom lobed, being ovate heart-shaped.

Chas. E. Billen, Philadelphia.—No. 12, the cultivated Poet's Narcissus (*Narcissus poeticus*). No. 11, *Sedum ternatum*, or Three-leaved Stone-crop, growing wild in rocky woods, also occasionally found in gardens, and often erroneously called a Moss. No. 13, *Viburnum prunifolium*, or Black Haw, a large and handsome shrub or small tree. No. 14, Winter Cress (*Barbarea vulgaris*, L.) No. 15, Daisy Fleabane (*Erigeron bellidifolium*, Muhl.) No. 16, Wild Geranium (*Geranium maculatum*, Linn.)

J. L. Townsend, Marshall, Mo., asks for information on the following subjects: 1st, Time to commence studying botany, whether summer or winter. 2nd, Books needed, their price, and where they can be purchased. 3rd, Magnifying glass, the size, number of lenses, where to be obtained, and price. 4th, Microscope for that class of students who wish to pay attention to the Cryptogamia, kind, price, and where obtained. 5th, Collecting box, size, material and cost. 6th, White printing paper, cost, whether best purchased of printers or dealers. 7th, Hints on preserving ripened capsules and seeds, so that the pressure will not scatter them. 8th, How to get the flowers and fruit from high trees. 9th, Books for the special students, and works describing the medicinal plants for those who would be interested in this class. 10th, Kind of box, case, or cabinet in which to place the holders containing the specimens, and whether to let them remain loose in the holders or fasten by mucilage or otherwise. 11th, Make of knife to use in dissecting plants. 12th, Full directions about making a portfolio for collecting specimens when on a journey. 13th, Method of preparing stone-fruits, so that they can be shown when ripe. 13th, How to examine dried specimens.

This is quite a formidable list of questions, but we will take them up *seriatim*, and answer as well as we are able.

1. The best time to commence studying botany is during the period of vegetable growth, when plants can be observed in a living state. Certainly something can be learned about plants by simply reading or studying the text-books; and we know that some teachers prefer to have their classes commence in the winter term and study morphology, physiology and classification, and then in the spring term enter upon the analysis of plants. This is probably a good plan for colleges and schools, for all the analytic botany that is obtained there is that obtained during the spring term, as the schools generally close in June, and do not reöpen until September, when the best part of the season has passed away.

2. There is no lack of good books on structural botany. No man has done more to extend the knowledge of botany in the United States than Prof. A. Gray, whose series of botanical works are not to be excelled. Prof. Wood has also a number of excellent works on the same subject. Students of Botany in that part of our country lying east of the Mississippi river will find in the Manual of Dr. Gray and the Class-book of Prof. Wood descriptions of nearly every plant they will be likely to find, exclusive of the lower cryptogamic orders. As we go westward of the Mississippi river, we find species which are not described in the works mentioned; these species become more and more numerous as we advance to the Rocky Mountains. Botanical students in that region of country will be unable to identify many of the plants they meet with. Probably within a few years some work will be published embracing all our vast territory. We have not at hand a list of prices of the botanical works we have mentioned, but they may be obtained through the booksellers of the country.

3. Good pocket lenses of two or three glasses may be obtained in most large towns. These will answer for the ordinary purposes of botanical investigation. There is a very neat arrangement of lenses, called Dr. Gray's microscope for the use of botanists, so contrived that the lenses may be fixed on a standard, and both hands left free to manipulate the object. This, we believe, costs from $2.50 to $4.00; but we do not know the manufacturers.

4. That class of students who wish to study cryptogamic plants, and to investigate the minute structure of the cells and tissues, etc., will need a compound microscope. We are hardly prepared to recommend any particular kind, further than to say that we would buy an American instrument. Excellent ones are made at Philadelphia, Boston, and other places; Chas. Stodder, 66 Milk street, Boston, advertises microscopes in the *American Naturalist*, and will undoubtedly furnish price lists, etc., on application.

5. The common collecting box is made of tin, in a cylindrical form, about two feet long and six inches in diameter, with a door or lid nearly the whole length. Specimens may be collected in this box, and if moistened will keep fresh for a day or two, and may be analysed at leisure. A box of this kind is especially useful to collect and keep material for analysis by a class; but most botanists, we apprehend, after a time drop the tin box and employ the portfolio, or collecting book. This is made of strong binder's board, eighteen or twenty inches long and ten or twelve wide, and may be either a simple cover, to be filled with loose sheets, or the sheets may be bound in with blank pieces after the manner of a scrap-book. The paper should be a strong, smooth and thick manilla. Into this book the specimens should be placed when collected, and may remain there several hours, or a day, until an opportunity occurs to transfer them to the press. The book may be fastened with straps and buckles at the side and ends, and a handle may be attached for convenience of carrying.

6. White printing paper may be procured either of printers or dealers, as may be most convenient. The price varies with the quality; it is usually sold by weight, or rather the price per ream depends on the weight.

7. Specimens containing capsules or pods should be collected before the fruit-vessels are fully ripe, when little trouble will usually be experienced from their bursting. If, however, the seed is likely to be scattered, it may be kept in a small paper sack, in the same paper with the specimen. Indeed, it is a good plan to have some seeds of every species kept in this way for ready examination. In cases where the seeds are too large, as in the oaks and hickories, they may be kept in suitable boxes, properly labeled and numbered.

8. For getting specimens of flowers and fruit from high trees, the usual mode is by climbing. Nurserymen and orchardists have contrivances, such as shears attached to a long handle, long-handled chisels, etc., which might be turned to advantage in some cases.

9. Students wishing to pursue only special departments of botanical investigation will require special works—as, for instance, Sullivant on the Mosses and Liverworts of the United States; Harvey on the Marine Algæ of North America. The medical uses and properties of our plants are treated of in the American Dispensatory, the Eclectic Dispensatory, Bigelow's American Medical Botany, and probably in other works with which we are unacquainted.

10. As to the final disposition of plants in the Herbarium; some keep them in folios, some in pasteboard boxes, and some in drawers. In every case they should be excluded from sunlight, and from the approach of insects. Wherever the collection cannot be made stationary and permanent, it will be better to use pasteboard boxes. At some future time we will give details. We will only say now that the specimens should be gummed to the sheet, either by the direct application of mucilage, or by means of narrow strips of gummed paper fastened across the stems of the plants at suitable intervals. We prefer the latter method.

11. We know of no special pattern of knife for dissecting plants. Any one with a sharp, thin blade will answer most purposes.

12. This has been answered under No. 5.

13. We know of no better way of preserving stone-fruits than by drying or keeping in alcohol.

14. In order to examine dried specimens, the flowers and small parts must be first thoroughly softened by immersion in hot water, or by means of steam. They may then be dissected in the usual way.

THE AMERICAN Entomologist and Botanist.

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Entomological Department.

CHARLES V. RILEY, Editor,
Room 29, Insurance Building, St. Louis, Mo.

ANNOUNCEMENT.

We hereby announce, by the mutual consent of both publishers and editors, that the American Entomologist and Botanist will be suspended during the year 1871. It is unnecessary to give the several reasons which have induced us to adopt this course. Few persons are aware of the labor required to conscientiously manage a journal of this character, and the health of the entomological editor has been so poor of late, and his other duties are so pressing, that he will be glad of the respite which this suspension will, in part, afford.

The suspension of a journal is generally looked upon as portending failure and discontinuance; but in the present case it has no such meaning. One more number, which will complete Volume II, will be issued before the end of the year, and, nothing preventing, Volume III will commence with the year 1872. All those who receive this announcement with regret, and who intend to renew their subscriptions in 1872, will do well to signify such intention to the publishers.

THE CODLING MOTH.

(*Carpocapsa pomonella*, Linnæus.)

HAY-BAND *vs.* RAGS—ONE OR TWO BROODED.

After a series of experiments, instituted the past summer, we have proved that, after all, the hay-band around the trunk of the tree is a more effectual trap for the Apple-worm than the rags placed in the fork of the tree. There is no superiority in the rags over the hay-band, unless the former are made to encircle the tree as thorougly as the latter. Where rags are placed simply in the forks, many of the worms pass down the tree from the outside of the branches. If the rag is tied around the trunk, it will impede almost every worm that crawls down the tree from the fruit which hangs on, or that crawls up the trunk from the fruit which falls; and it then has a decided advantage over the hay-band, because it can either be passed through a roller or scalded, and used again.

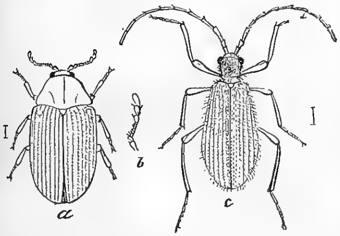
It has been very generally accepted in this country that the Codling Moth is double-brooded, and in all our writings on the subject we have stated it to be so, though no one, so far as we are aware, ever proved such to be the case beyond a doubt. Mr. P. C. Zeller, of Stettin, Prussia, informed us last winter that it is only single-brooded in that part of the world, and Harris gives it as his opinion that it is mostly so. Now, such may not improbably be the case in northern Prussia, and the more northern of the United States, though we incline to believe otherwise. At all events, this insect is invariably double-brooded in the latitude of St. Louis, and its natural history may be briefly told as follows: The first moths appear, and begin to lay their eggs, soon after the young apples begin to form. The great bulk of the worms which hatch from these eggs leave the fruit from the middle of May to the middle of June. These spin up, and in from two to three weeks produce moths, which pair and in their turn commence, in a few days, to lay eggs again. The worms (second brood) from these eggs leave the fruit, some of them as early as the first of September, others as late as Christmas. In either case they spin their cocoons as soon as they have left the apples, but do not assume the pupa state till towards spring—the moths from the late matured worms appearing almost as early as those from the earlier matured ones. The two broods interlock, so that in July worms of both may be found in the fruit of one and the same tree. We have repeatedly taken worms of the first brood, bred the moths from them, and obtained from these moths the second brood of worms; and we have done this both on enclosed fruit hanging on the tree in the open air, and on plucked fruit indoors. In the latter experiments the moths would often cover an apple with eggs, so that when the worms hatched they would enter from all sides, and soon so thoroughly perforate and devour the fruit as to die of starvation. This is a clear case of misdirected instinct in the parent, caused doubtless by confinement.

From the foregoing facts, it becomes obvious that the rags or the hay-band should be kept around the tree, say from the first of May till the fruit is all off; and to be thoroughly effectual, the insects collected in or under them should be destroyed regularly every fortnight during that time.

BOOK-WORMS.

BY HENRY SHIMER, M.D.

[Fig. 200.]



In contemplating this subject, it is not my purpose to dwell on that inappropriate and inelegant definition of this term given by Webster—"a student closely attached to books, or addicted to study"—but to briefly notice the work of insects in some of our libraries: for even our treasured volumes are not exempt from the ever-annoying pest of injurious insects.

When the lover of books finds that his choice and elegantly bound volume, which was placed in its case for safe keeping, has been riddled and marred, and may be ruined, by some ruthless worm, he is as much annoyed as the polished gentleman who finds that his fine cloth suit has been the prey of moths; or the careful lady, who finds the fur separated from the skin of her muff, or cape, by the same relentless foe.

Books have been infested with caterpillars, mites, and beetles, in foreign countries; and in our own country books have been occasionally injured by some of these insects; but, so far as I am informed, insects have not been very annoying in American libraries. Harris, in his general work on injurious insects, makes no allusion to them. I have observed worm-eaten volumes occasionally in some old eastern libraries, especially in New York city.

Several species of Boring beetles belonging to the family *Ptinidæ* destroy books, as well as many other kinds of property, even furniture, clothing, produce, pictures, etc., etc. M. Piegnot informs us that one of these penetrated directly through twenty-seven large quarto volumes in so straight a line that he was able to pass a string directly through and suspend the whole series of volumes. (Horner's Introd. to Bibliography, 311.)

During the past year I was not a little annoyed and surprised to find the larva of a species of *Ptinus* in some books in my office, from which I have bred the perfect insect, which proves to be the common Brown Ptinus (*Ptinus brunneus*, Dufs.=*P. frontalis*, Mels.)* They had injured several of my books, as well as many of the volumes of a small law library that had been recently shipped here from Keokuk, Iowa. Besides these, I have only seen one or two volumes in other libraries in Mount Carroll containing the marks of their work.

They usually operate in leather-bound or half-bound volumes, by boring galleries along in the leather where it is joined to the back of the leaves of the book; most frequently about the linial angle formed by the board-back, and the edge of the back of the leaves. Sometimes they are in the middle of the back, or about the corners of the book-back. They usually bore along quite under the surface of the leather, cutting it almost through; occasionally a small round hole penetrates through the leather to the outer surface. The galleries are filled with the debris.

This account of their work is, as I see it, where the insects are not yet very numerous; but I can readily foresee that they may, if unmolested, become so numerous as to eat up the binding and entirely ruin the volumes of a library.

Sheep-bound books seem to be their favorite resort; but I have found one larva in a cloth-bound volume about one of the binding cords where it is attached to the board, in all probability feeding on the paste used in the binding.

These insects may be well enough in some places, at least on the pins in an entomological collection, but I do not like their notions of book-gnawing. So to teach them better habits, I searched carefully and destroyed all I could find, and afterwards subjected the volumes to baking in an oven, being careful not to heat them sufficiently to burn the leather brittle. A better plan would be to put them into some water-tight box, and to immerse the box with its contents in boiling water long enough to heat the books through and through to near 212° Fah. If this does not clean them out, I shall brush the

*This and the following described insect were kindly determined by Dr. Horn.

books over thoroughly with a strong solution of corrosive sublimate.

Should these insects become more numerous, I shall prefer a cloth-bound book because of less liability of such books to be attacked by the insects. The bookbinder might easily remedy the difficulty by adding a little corrosive sublimate to the paste he uses; but to him there is an objection on the score of health.

This is an imported insect, and therefore is all the more to be feared according to the teachings of Mr. Walsh, who endeavored to prove that all imported insects are worse than the indigenous ones. The causes of this may be various, but the grand reason is supposed to be that the natural enemies in their native country do not accompany them in their migrations. Some entomologists, however, say that this species does but little harm.

Another Boring beetle of the *Ptinus* family (*Sitodrepa panicea*, Thomas=*Anobium paniceum*, Fabr.), feeds on capsicum and other spices, wafers, farinaceous meals, etc., and are numerous about drug stores, as I have seen in this town. The same insect was found in a handsome red bead made of some kind of colored paste, much to the annoyance of the young lady who was wearing it: for, strange as it may appear, nothing much more annoys a young lady than a harmless worm. I have had these beads in a close box, and there has been developed a new brood every year since I placed them in this confinement. The eggs are white, ovate, and probably each female only produces a few. By crushing a pregnant female I obtained six eggs. The larva of these bead beetles is somewhat hairy, yellowish-white, 6-legged, and coiled up by retracting the abdomen under the thorax. It is considerably corrugated, especially along the sides. The head is smooth, horny, and white, and the mandibles and parts about the mouth are black. It lives in the bead, and feeds so carefully that one would not suspect its presence were it not that the perfect insect eats a hole through the same to make its escape. Sometimes, but rarely, two were found in a bead.

When ground capsicum contains these insects it will be found cemented into somewhat irregular hollow balls, attached around the sides of the vessel in which it is contained. It is strange that they will live and thrive equally as well in such a pungent substance as they do in barley meal, if, indeed, they be one and the same insect, and I am not able to detect any marked difference between the capsicum, barley meal, and bead-inhabiting insects.

The larva of the Brown Ptinus, or Book-beetle, is similar in appearance to that of this Spice-beetle (*Sitodrepa*), but close examination shows it to be much more hairy. I have taken them from the books and placed them in small corked vials, and observed that they soon buried themselves in the cork, where they lived and fed for as much as two or three months. The Brown Ptinus matures in April and May, and at this time I have so often taken them in a basin or pail of water, during the past four years, that I conclude that it would be a good plan to set pans of water in the library for the purpose of entrapping the perfect insects.

These two insects, though belonging to the same family, are quite different in appearance. Compared with the Book-beetle (*Ptinus*), the Spice-beetle (*Sitodrepa*) is of a lighter brown, and is more nearly cylindrical. The antennæ are much smaller and mostly retracted after death. The Book-beetle is of a darker brown, usually considerably hump-backed, with the thorax considerably narrowed just in front of the wing-covers. It is more densely covered with hairs, and with a lens the hairs are seen much more conspicuously—stiff and bristle-like. I thus speak of their differences in contrast because some have considered them the same.

These insects produce a peculiar sound, which is supposed to be caused by striking their jaws against some foreign object, and which is, perhaps, made to attract their partners. This sound somewhat resembles the ticking of a watch, and ignorant and superstitious people believe it to be ominous of death—"*the death watch.*"

When apples are stored near the library, the Codling Moth, upon leaving the apple and seeking a place to transform, may locate itself in a book, as I have upon several occasions observed. When it enters the book between the back and leaves, it gnaws and mutilates them very much to make a desirable place in which to spin its cocoon. On one occasion I observed that the larva, after cutting through three or four leaves and spinning a good deal of silk, left for more desirable quarters. In this way many other caterpillars may injure books, when by accident they gain access to them.

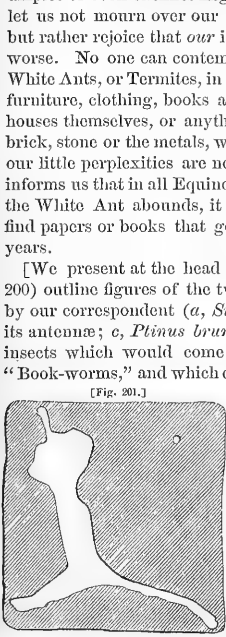
We read of various book enemies that have attracted attention from time to time. A caterpillar (*Aglossa pinguinalis*), said sometimes to subsist on butter and lard, does no little damage to books by fixing itself and spinning a web on the binding. Still another, according to Kirby and Spence, does much damage by taking its station between the leaves.

A mite (*Celetus eruditus*) eats the paste of the binding, and thus is a troublesome enemy.

(Schaub Australian Insects.) Many other examples of book enemies might be collected. But let us not mourn over our fate in this country, but rather rejoice that *our* insect enemies are no worse. No one can contemplate the ravages of White Ants, or Termites, in tropical climes, upon furniture, clothing, books and papers, and even houses themselves, or anything not composed of brick, stone or the metals, without rejoicing that our little perplexities are no worse. Humboldt informs us that in all Equinoctial America where the White Ant abounds, it is *infinitely rare* to find papers or books that go back fifty or sixty years.

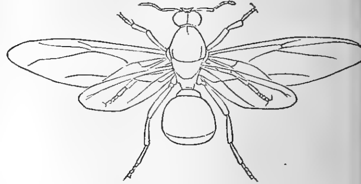
[We present at the head of this article (Fig. 200) outline figures of the two insects described by our correspondent (*a*, *Sitodrepa panicea; b*, its antennæ; *c*, *Ptinus brunneus*). Among the insects which would come under the head of "Book-worms," and which do considerable damage in this latitude, may be mentioned two species of *Pseudoneuroptera*. The first of these is the apterous form of a minute *Psocus*, commonly termed the "Book-louse." The most common species seems to be an apterous form of *Ps. domesticus*, Burm., an importation from Europe; though *Ps. amabilis* and *Ps. geologus*, Walsh, are also found in like situations. Both these last forms are normally apterous, and it is difficult to separate them from *domesticus*. The second book pest is the common Termite, or White Ant (*Termes flavipes*), the different forms of which we illustrated on page 266. Two years ago it was found that many of the books and public documents in the vaults at the capitol in Springfield, Illinois, were utterly ruined by the gnawings of some animal, which was subsequently proved to be this common N. A. Termite. These insects had made large irregular gnawings through many of them, and had discolored the leaves by their excrement. There is also now on exhibition at the St. Louis Mercantile Library, a large law-book, presented by Robt. McKenna, Esq., which was in like manner injured by these Termites while it lay in the St. Louis Court House. Our Figure 201 represents the outline of the gnawings. The entrance was made through the leathern cover, but did not quite reach through to the other side. In both these instances the books were kept in a rather damp place.—Ed.]

[Fig. 201.]



THE RED ANT OF TEXAS.

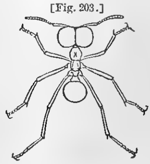
[Fig. 202.]



It is not often that I can find leisure moment to devote to writing, but as I have never seen anything in your periodical devoted to the Red Ant of Texas, and as we have for the past few days been digging them out in my yard and garden, I thought I would write you a few lines in regard to them; and herewith I enclose specimens of the same. The large Ant with *wings* is the female, of which few are found in a nest where there are countless millions, billions or trillions of workers. Now, no man probably ever saw one of these female ants appear at the *surface* of the earth voluntarily; and if they never come to the surface why are they provided with wings? You may say that they probably do come to the surface and that they have never been noticed, but I have seen many old men who were born in Texas, and have lived here for years myself, and none of us ever saw one of these female ants until a few years since, when one of their nests was *dug out*, and great was the astonishment of every one who beheld these enormous ants with wings; and at first few would believe that they were ants, but believed the story about them a hoax.

There are two varieties of the Red Ant here, one of which does but little damage (almost none), and works in the day time, in the bright sun, altogether. Their nests are comparatively small, usually having but one entrance. The workers differ in form from the "Cut Ant" in there not being such a disproportion between the head and the body. Little is known about their *habitation*, as they do but little damage, and I presume no one ever took the trouble to dig out their nests. The other variety of Red Ant is commonly known here as the "Cut Ant" (appropriately named), and ofttimes it is very destructive. Its habitation is underground, and consists (in a large nest such as we have just finished digging out) of many thousand apartments, varying in size from a walnut to a barrel,

[Fig. 203.]



nd all connected by underground passages or unnels. Some of these rooms are within two feet f the surface, whilst others are twenty feet be-eath. The nest proper we have just dug out overed a space fifty feet square, or 2,500 square eet, and descended beneath the surface more han fifteen feet, and the earth was completely oneycombed. As the earth separating the dif-erent rooms was frequently not more than an nch and a half thick, there were thousands of hese rooms, and it would be impossible to esti-nate the number of ants present, some old and ome just hatched (being as white as snow), thers very small but able to navigate without ssistance. We also found many million eggs. Like the spider, they seem to have great affec-ion for their young and eggs, and even when heir nest is destroyed and sure death awaits hem all (for they, like the bee, are evidently loomed when the female is lost) they will pick p their helpless young and carry them off, and vill die rather than release their burden. Their nest proper seldom occupies a space exceeding ifty or a hundred feet square, but radiating in every direction are underground passages ex-tending sometimes a quarter of a mile from head-quarters, and often passing under wagon-roads. These are their roads by which or through which they convey the material in which are deposited the eggs. This material usually consists of the eaves of trees, shrubs and some vegetables. The young leaves of the elm, china and peach trees, of the rose bush, pea, carrot, strawberry, etc., are favorite subjects of their attention, and the number of trees they will entirely denude in the course of a single night (for they only work at night and on cloudy days) is surprising. These leaves are conveyed through these underground passages to their home and deposited in one of their chambers, and, I presume, they excrete some substance that they put with the leaves, for if a handful of the leaves is taken in the hand and squeezed, a ball is made very much resem-bling coarse beeswax, and when dried is as hard as dry putty. I judge the leaves by their decay produce a gentle heat, or, at least, maintain a uni-form temperature whereby the eggs are hatched. Formerly it was supposed that these leaves con-stituted a store of food, but such is not the case. Whether they feed upon vegetable or animal food I cannot say. I have known them to carry off a barrel of wheat in a few nights, and I have seen them destroy and carry off caterpillars and other small worms; and if a snake be killed and thrown on the ground near their nest, they will in a very short time strip every particle of flesh from the bones, leaving a mere skeleton.

To the stranger the sight of these little marau-ders when at work is an interesting one, forming as they do a long procession of many thousands, closely following one another in the same path, each with a leaf or portion of a leaf, much larger than himself, elevated over the body, and resem-bling an umbrella.

Their bite and sting (for they have a minute sting) is very severe in a tender part of the human body; much more so than the sting of a bee, and as they rush to the attack when dis-turbed, one must provide himself with boots and tuck his pants into the tops when he proceeds to dig out a nest.

BENJ. R. TOWNSEND.

AUSTIN, Texas.

[The ant referred to, which our correspondent sent, is the Cutting Ant of Texas (*Atta ferens*, Say*). We present above figures of the queen (Fig. 202) and of the worker (Fig. 203), bor-rowed from the *American Naturalist*. Accord-ing to Mr. Edward Norton, the females of all ants remain in their nests, except at pairing time, when they appear for a short time in great numbers, males and females, and then scatter for the purpose of founding new colonies. To prevent their departure, the workers cut off the wings of many females, which then die or re-turn to the nest.

Dr. Sumichrast states that this ant *swarms* at the commencement of the rainy season (May), and probably in the night, for one finds the neigh-borhood of the formicary strewn with the dead bodies of the males and females in the morning.

Our correspondent may be right in stating that, as with the bees, sure death awaits the nest of ants if the female is lost, for few females are found during the greater part of the year; but there must be at the pairing or swarming season above referred to, a great many females which then lay their eggs and die—the workers taking charge of these eggs.

We hope Mr. Townsend will make further observations on this subject, and we shall be glad to receive more perfect specimens, as those ac-companying the communication were all broken. —ED.]

* This is the *Œcodoma Mexicana* of Smith (Brit. Mus. Cat., VI, 185, and Norton, *Am. Nat.*, II, p. 66. *Myrmica Tex-ana*, Buckley, Proc. Acad. Nat. Sci. Phil., 1861, page 9. *Œcodoma Texana*, Buckley, Proc. Ent. Soc. Phil., V, p. 347.

LABOR on, good entomologists! and find out the secrets of these and similar little enemies of mankind, and we will heartily aid your cause by disseminating the knowledge you acquire as widely as we may, for we deem the subject of insect pests to be the most important question now before the agricultural community of this country.—*Scientific American.*

SOME GOOD THOUGHTS FROM AN EMINENT ENTOMOLOGIST.

In the chapter on Diptera, in the "Record of American Entomology for the year 1869," we find the following remarks from Baron Osten Sacken, which we heartily commend:

"However meagre dipterology has appeared among us in 1869, there is a good deal of comfort to be derived from the healthy direction it is taking. Together with the other branches of entomology in this country, it has assumed an eminently practical tendency. By *practical* I do not merely mean the relation of entomology to the dollars and cents question, but its relation to living nature in general. The more this science progresses in America, the more it becomes apparent that its development does not depend on the necessity of putting in order a museum and classifying some boxed up specimens, but from the craving to understand living nature and the desire to master it when necessary. This craving for knowledge among the masses in America is as remarkable as the keen eye for observation, and the open mind which are brought into play to satisfy this instinct. Entomologists often receive letters of inquiry from farmers, gardeners, mechanics and other persons, mostly deficient in a preparatory knowledge of natural history; and they generally have every reason to be astonished at the fulness and accuracy of the observations of these men of manual labor, as well as at the shrewdness displayed in the management of their experiments. Very often an investigation is fully carried out by them, and all that they apply for to a scientific entomologist is the scientific name of the specimen. But here lies the difficulty. In a great many cases this name cannot be given with any degree of certainty, on account of the insufficiency or the absolute want of specific descriptions.

"If we have reason to rejoice at the healthy direction American entomology is taking, it is not without an eye to those, unfortunately very numerous, persons who seem to think that the so-called descriptive entomology is the aim and end of science. When a Champollion, or a Grotefend attempt to study hyeroglyphic or cuniform inscriptions, do they look upon the compilation of a dictionary of these modes of writing as the ultimate aim of their efforts? It is evident that the dictionary in this case is only a stepping-stone towards the real end in view—the bringing to light the treasures of facts buried in ancient inscriptions. Descriptive natural history furnishes the dictionary of nature; it gives names to objects, which without these names it would be impossible to designate. When a gardener has observed the operations of some noxious fly, he applies to you for its *name*, because the knowledge of the name will enable him to communicate to others the knowledge he has acquired of the habits of the insect."

INSECT SOUNDS.

For many years it has been alternately asserted and contradicted, that the Death's-head Moth (*Acherontia atropos*) possesses the power of emitting sounds on certain occasions; and recently it has been contended that the caterpillar, and also the pupa of this moth, possess a similar power. Newman, I believe, in his work on "British Moths," brings forward authority to prove it; and DeGeer, Reaumur, Kirby, and other authors, believe in the fact.

A correspondent of *Science Gossip*, over the signature of "A. Mercer," relates the following circumstance, which would seem to settle the question. He states that he had placed the pupa of *A. atropos* in some damp moss, and says: "In this position it was kept for about two months, during which time I repeatedly heard the noise. On being touched it would emit a noise resembling the chirrup of the grasshopper."

Another correspondent states that he never heard the noise from the pupa, "but had frequently heard a sound from the caterpillar. It was generally short and abrupt, like the tick of a watch. I could always induce the creature to make a noise by touching it rather smartly with the finger." Other correspondents testify to the same thing, so there would seem to remain no doubt that *A. atropos* emits sounds in every stage of its existence. But is this power of speech, as it may be called, peculiar to this insect? Very unlikely.

Another correspondent of *Science Gossip* says that, "In several butterflies I have noticed that when caught they have emitted a sound like that of a blow-fly. Having caught a specimen of the small Tortoise-shell (*Vanessa articæ*), on proceeding to nip it near the nose, I was struck by the sound it made, only differing in intensity from that made by a fly under similar circumstances." Here, however, I imagine the sounds were occasioned by the vibration of the confined wings.

But that caterpillars are capable of making sounds may be fully ascertained by almost every one that possesses a grape-vine. The larva of *Thyreus Abbotii*, as is generally well known, has the habit, when touched, of violently jerking itself, and bringing the head and tail nearly together, first on one side and then on the other. Each act of jerking is accompanied by a sharp, creaking sort of noise, not unlike the subdued chirp of a grasshopper. It may be necessary for some persons to bring the ear rather near the larva to hear the sounds, but to persons having good auditory nerves the noise is patent enough, and I have no doubt it is audible enough to Ichneumon flies and other parasites. Now, how are these sounds produced? Is it by a sharp emission of air through the breathing holes?

It is remarkable that when attacked this caterpillar always elevates its tail, which, in that position, looks like a snake's head, the glossy tubercle adding to the deception; and this cyclopean appearance renders it a quite formidable animal to look at.

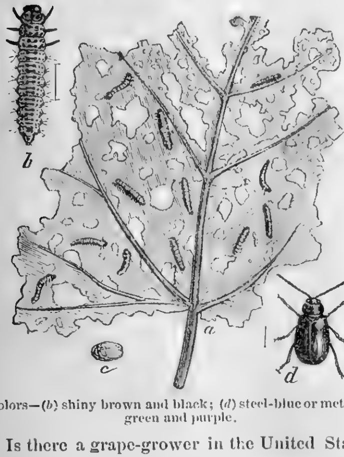
W. V. ANDREWS.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 12.

The Grape-vine Flea-beetle.

(*Haltica chalybea*, Illiger.)

[Fig. 204.]



Colors—(*b*) shiny brown and black; (*d*) steel-blue or metallic green and purple.

Is there a grape-grower in the United States who does not know, to his sorrow, what the Grape-vine Flea-beetle is? Hardly one! And yet how few ever connect it with its disgusting little shiny brown larvæ, which generally prove still more injurious than the beetle, by riddling the leaves in the middle of summer.

The Grape-vine Flea-beetle (Fig. 204, *d*) often goes by the cognomen of "Steel-blue Beetle," and is even dubbed "Thrips" by some vineyardists. The latter term, as most of our readers are well aware, is entirely inapplicable.* The former name is not sufficiently characteristic, because the color varies from steel-blue to metallic-green and purple, and because there are many other flea-beetles to which it would equally apply.

The Grape-vine Flea-beetle is found in all parts of the United States and in the Canadas, and it habitually feeds on the Alder (*Alnus serrulata*), as well as upon the wild and cultivated Grape-vine. Its depredations seem first to have been noticed in 1831, by Judge Darling of Connecticut, and in 1831 Mr. David Thomas, of New York, published an account of it in the 26th volume of Silliman's *American Journal of Science*. Its transformations were, however, unknown till some time after Dr. Harris wrote his excellent work on Injurious Insects, and no figure of the larva has been hitherto published.

The beetles hibernate in a torpid state under any shelter which is afforded them in the vineyard, such as the loose bark and crevices of stakes, etc., etc., and they are roused to activity quite early in the spring. The greatest damage is done by them at this early season, for they often bore into and scoop out the unopened bud, and thus blight the grape-grower's bright expectations. As the leaves expand, the little jumping rascals feed on the leaves, and soon pair and deposit their small orange eggs in clusters, very much as in the case of the Colorado Potato Beetle. These eggs soon hatch into dark-colored larvæ, which may be found of all sizes during the latter part of May and early part of June. They are generally found on the upper surface of the leaf, which they so riddle and devour as to give it the appearance represented at Figure 204, *a*. When very numerous they devour all but the very largest leaf-ribs, and we have seen the wild vines throughout whole strips of country rendered most unsightly by the utter denudation which these insects had wrought. The larvæ feed for nearly a month, and when full grown present the appearance of Figure 204, *b*, the hair-line at the side showing the natural size.† They then descend from the

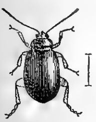
* The term *Thrips* is confined to an anomalous group of insects—mostly cannibal, but exceptionally vegetable-feeding—of which Halliday made a separate Order (*Thysanoptera*), but which are to-day included in the *Homoptera*, or Whole-winged Bugs, by most authors, though they seem to have close affinities to the *Orthoptera*, and to the *Pseudoneuroptera*.

† We append a full description, drawn up from many living specimens:

HALTICA CHALYBEA, Illig.—*Full-grown Larva*—Length, 0.35 inch. Head polished black. Body livid-brown above, paler beneath; subcylindrical, the joints bulging, especially at sides, and each divided superiorly into two transverse folds; on each fold a row of six shiny-black elevated spots, the dorsal ones larger than the others, and often (especially the posterior two) confluent, or divided only by a very narrow dorsal line; each spot giving rise to a single short stiff hair; one such substigmatal black spot placed in middle vine and bury themselves a short distance in the earth, where, after each forming a little earthen cell (Fig. 204, *c*), they change to pupæ of a deep dull yellow color, and in about three weeks more issue as beetles. These beetles leave the ground from the middle of June to the middle of July, and, so far as we are aware, do not breed again till the following spring—there being but one brood each year. They subsist on the leaves during the fall, but the damage they inflict is trifling compared to that which they cause in spring.

Like all other Flea-beetles, this species has very stout, swollen hind thighs, which, though hidden in our Figure 204, *d*, are well represented in the accompanying cut (Fig. 205). By means of these strong thighs they are enabled to jump about very energetically, and are consequently very difficult to manage during the summer months. In the winter time, however, they can be destroyed in great numbers while hidden in a torpid state in their retreats. Clean culture and general cleanliness in a vineyard will, to a great extent, prevent this insect's increase. Dr. Hull, of Alton, Ills., tells us* that they were once so numerous in a small vineyard of his, that in the spring of 1867 he burnt them out by surrounding them with fire, and letting the fire run through the dry grass in the vineyard. "It was a rough remedy, but as his crop was destroyed, he let the beetles follow suit."

[Fig. 205.]



The larvæ can be more easily destroyed by an application of dry lime, used with a common sand-blower or bellows. This has been found to be more effectual than either lye or soap-suds, and is withal the safest, as lye, if used too strong, will injure the leaves.

This insect, like so many others, will one year swarm prodigiously, and then again be scarcely noticed; and such changes in its numbers depend mainly on conditions of the weather, as we know of no parasite which attacks it. In the spring of 1868, though they were at first out in full force, yet after some subsequent severe and cold weather, they had mostly disappeared. They are apt to be most troublesome where Alder abounds in the woods.

of joint, and more elongated than the rest, being apparently composed of two confluent ones, as it gives rise to two hairs. Three ventral spots, one anteriorly, which is large, transversely-elongate, central and without hairs; and two posteriorly (one each side) which are small and piliferous. Six black thoracic legs, and one anal orange proleg.

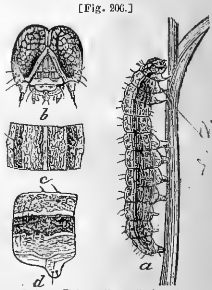
Pupa—Length, 0.14 inch. Normal Chrysomelid form. Deep dull yellow, and covered more or less above with short black bristles arranged in a transverse row across each joint, and each arising from a slight elevation: two stouter anal bristles or thorns. Eyes brown. Tips of jaws brown.

**Proc. Alton Hort. Soc.* for May, 1867.

THE FALL ARMY WORM.

From many parts of Missouri and Illinois, complaints reach us of the ravages of the "Fall Army-worm." We have received specimens from Moniteau, Jefferson, St. Louis, Pulaski and Cole counties in Missouri, and accounts of its injuries reach us almost every day from the northeastern portion of the State. What is this "Fall Army-worm?" will be anxiously asked by the entomological reader; but we doubt whether there is yet any one in this wide world who can tell with any degree of assurance. We can say, that it is a dark worm, the larva of some species of Owlet Moth, and very closely allied to the true Army-worm (*Leucania unipuncta*, Haw.), but more than this we do not at present know, for the insect has never been traced through its transformations. In the fall of 1868 we received a few specimens from Mr. T. R. Allen, with an account of their injuring newly sown wheat on oat stubble. On page 88 of our First Missouri Report we briefly described it, under the name of "Wheat Cut-worm;" but we failed to raise the perfect insect, and, unless the moths issue this fall, we must wait till the spring of 1871 before we can connect this worm with its parent. In July, 1868, we received from Mr. E. Daggy, of Tuscola, Illinois, specimens of a worm which was injuring his corn, and we then replied through the colums of the *Prairie Farmer* that it was a new species. Subsequently Mr. Walsh also received specimens of the same worm, and during the latter part of July we both of us bred the moth, which proved to be a new and very variable species of *Prodenia*, and which we determined to call *Daggyi*.* The Fall Army-worm agrees so well with that which Mr. Daggy sent us, that, in all probability, it will prove to be the same species; but as it is so variable, we can only conjecture till we succeed in obtaining the perfect insect.

[Fig. 206.]



Colors—Pale yellow, flesh-color, reddish-brown and black.

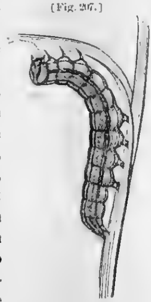
The popular term of "Fall Army-worm" is altogether more indicative than that of "Wheat Cut-worm," since the species does not confine its attacks to wheat, and not only very closely

*See p. 43 of this volume.

resembles the Army-worm in appearance, but has many habits in common.

Let the two not be confounded, however. The true Army-worm never appears in the fall of the year, but always about the time when wheat is getting beyond the milk state; and it generally disappears, in the latitude of St. Louis, by the first of June. It confines its attacks entirely to the grasses and cereals, whereas the species under consideration is a much more general feeder, devouring with equal relish most succulent plants, such as wheat, oats, corn, barley, grasses, purslane, turnips, and, as Mr. J. M. Jordan of St. Louis informs us, even spruces. Moreover, when critically examined, the two worms show many characteristic differences, as will be seen by comparing Figure 207, which represents the true Army-worm, with Figure 206, which represents at *a* the Fall Army-worm natural size, at *b* its head magnified, at *c* a magnified dorsal view of one of the joints, and at *d* a magnified side view of same.*

[Fig. 207.]



Colors—Dull black, white, dull yellow and pink.

With us the Fall Army-worm has done more injury to corn than to anything else. It not only greedily devours the leaves and stem, but bores large holes through the ears, burrowing in them in all directions. On late corn it is frequently found in the same ear with the Corn-worm, *alias* Cotton Boll-worm (*Heliothis armigera*). Indeed, it is as often confounded with this last insect as with the true Army-worm, and in reality more nearly resembles it. The Boll-worm is, however, rougher, generally paler, striped differently (see Figs. 150 and 151 of Vol. I), and always readily distinguished by having a larger gamboge-yellow or reddish head, which invariably lacks the distinct white inverted **Y**-shaped mark, and the darker shadings of the head of the Fall Army-worm. The same remedies which we have suggested for the true Army-worm apply here, and our crowded columns forbid their repetition.

We shall be glad to receive data from our Missouri correspondents relative to the amount of damage done by this worm in their own section; or to get any other information regarding it.

P. S.—Since the above was in type, and just as our forms are being made up, we have (Sept. 20th) bred the parent moth of the Fall Army-worm; and, as we anticipated, it proves to be the very same undescribed species of *Prodenia* which we bred from Mr. Daggy's worms. We shall describe it in our next issue under the more appropriate specific name of *autumnalis.*

*Those who desire to know more of the true Army-worm can refer to Vol. I, No. 2, or to pp 37–56 of the Second Entomological Report of Missouri, where they will find a complete account of it.

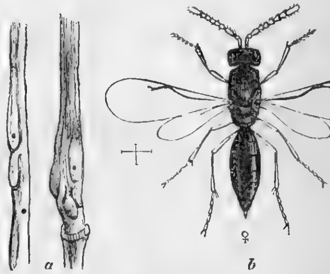
On the Group Eurytomides of the Hymenopterous Family Chalcididæ:

WITH REMARKS ON THE THEORY OF SPECIES, AND A DESCRIPTION OF ANTIGASTER, A NEW AND VERY ANOMALOUS GENUS OF CHALCIDIDÆ.

BY BENJ. D. WALSH, M.A.

[*Continued from page 301.*]

[Fig. 3.]



GENUS ISOSOMA.

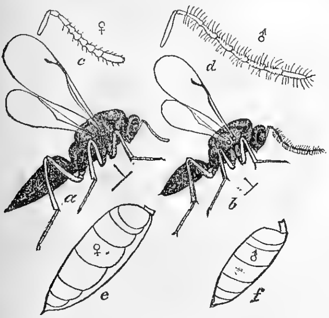
To this genus, as limited above, must be referred the notorious Joint-worm Fly, which I have clearly ascertained to be the veritable author of the galls upon the stems of wheat, barley and rye, a figure of which galls will be found above (Fig 3, *a*). From Harris and Fitch down to Glover and Packard, all authors have hitherto referred this insect to the genus *Eurytoma*, from which, however, it differs essentially. If it could with any propriety be referred to that genus, we should then have a case of the same genus including both parasitic and plant-feeding species; and I do not believe that any such violation of the great law of the UNITY OF HABITS can be met with anywhere in nature. As long ago as 1867, I published in the *Canada Farmer* for that year (pp. 267-8) a short article, acknowledging my error (as given to the world in the *Practical Entomologist* 1, pp. 10-12 and 37-38) in disputing the conclusions at which Harris and Fitch had many years before arrived, namely, that the Joint-worm Fly is the real author of the Joint-worm galls. In this same article will also be found the following passage, in regard to the generic determination of this insect: "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." Certainly, if preceding authors had referred this species to its proper genus, I should not have been so unwilling to believe in its being a true vegetable-feeder. As soon as I became personally acquainted with it, the mystery was solved at once

There is another question, relative to the scientific nomenclature of this insect, which I have recently discussed at some length in the columns of the AMERICAN ENTOMOLOGIST, in an article on the Joint-worm. (Vol. I, No. 8.) Joint-worm Flies, as it appears, have been bred from precisely similar galls growing respectively upon wheat, rye and barley, by Dr. Harris and Dr. Fitch. Dr. Harris was of opinion that they were all varieties of one and the same species; but Dr. Fitch, basing his opinion chiefly upon a slight difference in the coloration of the legs, has made four different species of them, which he separates as follows (*N.Y. Rep.* III, p. 154):

Eurytoma tritici, Fitch.—On wheat. Front tibiæ dull, pale yellow; middle and hind tibiæ black.
Eurytoma secalis, Fitch.—On rye. Front and hind tibiæ dull, pale yellow; middle tibiæ black.
Eurytoma hordei, Harris.—On barley. Front tibiæ of the same dusky or blackish color with the middle and hind ones.
Eurytoma fulvipes, Fitch.—On barley. Legs, including all the tibiæ, bright tawny yellow.

My experience runs entirely counter to the existence of any such colorational distinctions between these four so-called species. I bred and preserved 23 ♂ and 47 ♀ from Canadian barley-galls, and I found that most of them were *tritici* Fitch, two were *secalis* Fitch, a few verged upon *hordei* Harris, and seven verged upon *fulvipes* Fitch; and that numerous intermediate grades occurred between all these four forms. Therefore, I incline to believe that Fitch's three so-called species are—so far as the facts indicate—mere synonyms of *hordei* Harris; and that the correct name for all the Joint-worm Flies that infest small grain is *Isosoma hordei*, Harris. As the reader will at once perceive, from the descriptions of the different species of *Eurytoma* and *Decatoma* given above, if I had regarded slight differences in the coloration of the legs as of specific value, I should have made several hundred new species where I now make only about a dozen.

[Fig. 4]



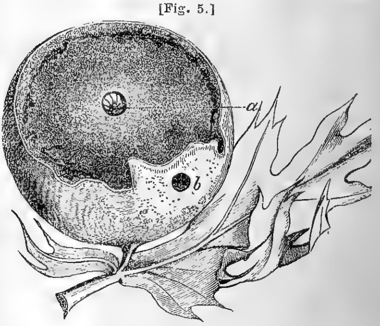
I give herewith figures (Fig. 3 and Fig. 4) of *Isosoma hordei* ♂ ♀, drawn by Mr. Riley from specimens bred from Canadian barley-galls. It is not necessary to describe the species, as this has already been done in a very full manner by Fitch. (*N. Y. Rep.* III, pp. 162–3.)

I do not deny the possibility of the Joint-worms infesting respectively wheat, rye and barley being what I have called "phytophagic species." (See *Proc. Ent. Soc. Phil.* III, pp. 403—430, and V, pp. 194—216.) But, before I believe in such a fact, I require some satisfactory proof of it, which has never yet been given. If they are so, then the flies that have bred in a particular wheat field can never infest an adjoining barley field, and so on. So far as the recorded facts go, they point directly in the opposite direction. Dr. Fitch, for example, allows that he himself found 3♂ and several ♀, which he identified as being *hordei*, on the growing rye of a rye field at the end of May and beginning of June. (*N. Y. Rep.* III, p. 159.) Now, if these insects did not intend to attack the rye, what business could they have there?

I am well aware that, with most entomologists, the mere proof of the fact that two imagos cannot be distinguished in the cabinet is sufficient to establish their specific identity. For myself, I hold very different opinions. I consider the ordinary determinations of species by the mere comparison of a few cabinet specimens of the imago to be only provisional—a kind of entomological make-shift till we can arrive at something more definite and satisfactory. To approximate to a correct knowledge of specific limitations we must go out into the woods and the fields, and study insects, not only in the imago state but in all their states, from the egg to the mature form. We must attend to habits, as well as to external structure; for it may—and I believe does—frequently happen that, although the external structure and the coloration of two forms be absolutely undistinguishable, yet that their internal structure may differ so widely that their habits may be invariably very different, and the two must consequently, if constant difference of structure makes difference of species, belong to two distinct species.

We have a notable example of such a contingency in two vernal forms of *Cynips—C. q spongifica*, O. S., and *C. q. inanis*, O. S.—which infest distinct oaks, produce quite dis-

[Fig. 5.]

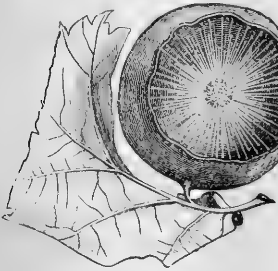


tinct galls, and of one of which there is an autumnal agamous dimorphous ♀—*C. q. aciculata*—while of the other species (*C q. inanis*) I am as certain as I can be of any negative fact that no such dimorphous ♀ exists. Yet the cabinet specimens of the two vernal types cannot be distinguished; and any closet naturalist who received a hundred of each of them would infallibly pronounce them to be all identical. But that there must exist internal structural differences between the two, and consequently that the two are distinct species, is sufficiently proved by two separate facts: 1st, that the galls produced by the two are invariably different, whence it follows that the gall-generating poison, and consequently the internal organs that secrete that poison, must be different in the two; 2nd, that the system of one form gives origin to but a single type of ♀, and the system of the other form generates two entirely distinct and dimorphous ♀♀, and consequently that the reproductive systems of the two must be essentially different in some part or parts of their internal organization.

For the satisfaction of those who are not acquainted with the galls produced by these two gall-flies, I give drawings of each (Figs. 5 and 6) from the pencil of Mr. Riley. Figure 5 is the gall produced by *C. q. spongifica* upon Black Oak, and Figure 6 is that produced by *C. q. inanis* upon Red Oak. Lest it should be imagined that it is the difference in the species of oak that causes the difference in the characters of each of these two galls, it is proper to refer the reader here to the list that I formerly published (*Proc. Ent. Soc. Phil.* III, p. 638, note)—and I could now add many more such cases—where the same gall-fly produces the same gall upon distinct species of oak. Moreover, Ratzeburg, as quoted by Osten Sacken, asserts from personal observation, "that the European *Cynips fecundatrix* of the *Quercus pedunculata* produced the same gall as it produces upon the European oak when it attacked some American oaks in his garden." (*Ibid* I, p. 248.)

As to the hypothesis broached by Dr. Reinhard,* that the form *q. aciculata* is the only true gall-making form, and that both *q. spongifica* and *q. inanis* are inquilinous; that is sufficiently refuted by the negative fact that no form analagous to *q. aciculata* can be obtained, after extensive trials repeated through several years, from the gall *Q. inanis*. For if in reality *Cynips q. inanis* is a mere guest-fly in the gall *Q. inanis*, where are we to find a gall-maker distinct from that species to produce that gall? I am quite sure that none such exists. On the other hand, it is absurd to suppose that, of two undistinguishable gall-flies, *C. q. spongifica* and *C. q. inanis*, the first is a guest-fly and the second a gall-maker.

[Fig. 6.]



The alternative hypothesis advanced by Reinhard as a solution of the mysterious anomaly of *q. aciculata* being the dimorphous ♀ form of *q. spongifica*, namely that each of these two forms is a distinct gall-making species, is of very doubtful validity, for the simple reason that the galls that produce these two forms are very complicated in their structure and present a number of very constant characters, and are, notwithstanding, undistinguishable the one from the other. It is very true that there are certain polythalamous galls, of very simple structure, being in fact little else than a simple enlargement of a twig, which can scarcely be distinguished from one another, although they are the work of distinct gall-makers. Indeed, polythalamous galls are very generally more difficult to characterize than monothalamous galls, because their shape and size depend upon the number of gall-making larvæ that they contain, which will often vary from two or three to two or three score. Monothalamous galls, on the contrary, are as definitely limited in size and shape as are the great majority of the different species of insects; and moreover, as a rule, they present much more numerous and more accurately distinctive characters than do polythalamous galls. Now, the oak-gall that we are now concerned with—that of *Cynips q. spongifica*—is a monothalamous gall, and is just as much individualized, and just as easily recognized, as is an apple, a peach, or a plum; and, moreover, the galls that produce the autumnal dimorphous ♀ form (*q. aciculata*) occur upon the very same tree, and in company with those that produce the vernal bisexual form (*q. spongifica* ♂ ♀).

Dr. Reinhard, in the paper already referred to (p 7), in confirmation of his second hypothesis of *C. q. spongifica* and *C. q aciculata* being each of them true gall-makers, producing upon the same plant galls that are apparently, but not really, identical, quotes the following two European cases of undistinguishable galls being produced upon the same plant by distinct insects: 1st. Two exactly similar twig-galls on blackberry, produced respectively by *Lasioptera rubi* and *Diastrophus rubi*. Now, I am familiar with an undescribed N. A. twig-gall, *Rubi nodus*, Walsh MS., produced by an undescribed *Lasioptera* allied to *L. solidaginis*, O. S., upon an American blackberry. This blackberry-gall is a simple enlargement of the twig, usually but not always on the part adjoining a bud, and is also polythalamous; and, as it is produced on the same genus of plants, on the same part of the plant, and by the very same Cecidomyidous subgenus as the Cecidomyidous blackberry-gall spoken of by Reinhard, it may reasonably be inferred that this last is of a similar nature. In that event, I can see nothing very astonishing in its being scarcely distinguishable from a similar gall made on the same part of the same plant by a *Diastrophus*. 2nd. The second case quoted by Dr. Reinhard is that of two undistinguishable leaf-galls upon *Quercus cerris*, produced respectively by *Cecidomyia circinans*, Giraud, and *Cynips (neuroterus) lanuginosus*, Giraud. Now, I cannot help suspecting that in this latter case there exists but a single species of gall, made by the gall-gnat, *Cecidomyia circinans*, and occasionally tenanted by an inquilinous gall-fly, *Neuroterus lanuginosus*. The genus, or rather subgenus, *Neuroterus* of Hartig is said by Hartig himself, as quoted by Osten Sacken, to be sometimes inquilinous;* and I am now acquainted with no less than three cases where gall-flies are inquilinous in galls that I know for certain to be made by gall-gnats. I have already published one such case (*Proc. Ent. Soc. Phil.* III, p. 518); and I have since bred, on June 5th, 4 ♀ *Ceroptres* from the Cecidomyidous willow-gall, *S. batatas*, Walsh; and from an undescribed twig-gall upon Dogwood, produced by an undescribed *Lasioptera* allied to *L. solidaginis*, O. S., but distinct from the species just now referred to as bred from a blackberry gall, I bred, June 23rd, two specimens ♂ ♀ of a *Synergus*, both genera, *Ceroptres* and *Synergus*, being Cynipidous and notoriously inquilinous in their habits. Many analogous cases of gall-makers and inquilines, belonging to widely distinct families, being produced from one and the same gall have been recorded by me in my Papers on Willow-galls (*Proc. Ent. Soc. Phil.* III, pp. 543-644, and VI, 223-288).

But all doubts as to the dimorphism of the agamous *Cynips q. aciculata* has, to my mind, been removed by a series of experiments which I conducted, after my Paper on that subject had been published in the summer of 1864. (*Proc. Ent. Soc. Phil.* II, pp. 443-500.) Of these experiments I will now proceed to give the full history in all its details. The reader can then judge for himself how far my facts are to be depended on, and how far the inferences that I deduce from those facts are the logical results from the prémises. I shall not be surprised, however, if, in spite of all that I can say, my theory is received with as great incredulity as that with which I formerly received the important discovery of Wagner, in regard to the viviparous reproduction of the larvæ of a certain genus of *Cecidomyidæ*.

On October 29th and November 6th, 1864, I colonized a number of these agamous gall-flies, that I had bred myself from oak-apples, upon three different isolated black oaks, that I knew to have not been previously infested by these galls for many years back Two of these trees were very large—say about 2½ feet in diameter at the butt—and I placed the gall-flies upon one particular overhanging bough of each of them, and on no other part of the tree. The third tree was small—say 1 foot in diameter at the butt—and I placed the gall-flies on the trunk of this tree, at the point where the main branches took their origin.

On May 21, 1865, I examined all these three trees. The first large tree had no galls at all on it. The second large tree had produced four *Q. spongifica* galls, partly on the very bough on which I had placed the gall-flies in the preceding autumn, and partly on some boughs that immediately adjoined it. I estimated that the portion of this last tree thus occupied by galls did not form more than one-twentieth of the whole tree; so that, even if we suppose that one or more wandering *Cynips q. aciculata* had flown on to this tree from the neighboring woods in the preceding autumn—and this insect, coming out as it does so late in the year, flies as reluctantly and as dully as a Plant-louse—the chances are about 19 to 1 that they would not have occupied the particular portion of it found to bear galls in the following spring. On

* *Berlin Entomol. Zeitschr.* IX, p. 9.

* See *Proc. Ent. Soc. Phil.* IV, pp. 331 and 336.

the other hand, as there certainly is not more than one-hundredth part of the black oaks growing near Rock Island that produce any oak-apples at all in any particular year, the chances are at least 99 to 1 against any particular black oak there, taken indiscriminately, bearing oak-apples in any particular year. Consequently, the compound chance of any particular black oak, taken at random from those growing near Rock Island, not only bearing them in a particular year, but bearing them exclusively upon a particular portion of its boughs, previously designated and forming only one-twentieth part of the entire mass of its boughs, is, according to the theory of chances, $\frac{1}{2000}$; or, in ordinary parlance, the chances are 1,999 to 1 against such an improbable event happening. But these chances are founded on the supposition of the tree that was experimented on having been taken at random without any selection; whereas, instead of taking it at random, I exercised the greatest possible care in every instance, 1st, to select a black oak that grew a long way off from any other black oaks, and, 2nd, to select one that I was familiar with and had watched for years, and knew not to have borne any oak-apples for several years preceding. It is difficult, and in fact almost impossible, to estimate in figures to what an extent these additional precautions increased the odds specified above; but it is quite clear that the increase must have been very great. Taking everything into consideration, we may conclude, with a degree of certainty amounting to moral conviction, that it was not mere chance that caused the four oak-apples to grow upon the large black oak that I was at this period experimenting on, but that they were generated by the gall-flies I had myself placed there in the preceding autumn. And a similar mode of reasoning will apply to the other experiment, the results of which will be subsequently given in detail.

Some persons, perhaps, who are not familiar with the theory of chances, may consider such odds as those specified just now to be insufficient to produce moral conviction. Yet the very same men, when serving on a jury, will feel no scruple at condemning a prisoner to the gallows for murder, although it is mathematically demonstrable that the chance of any supposed murderer taken at random, who is hung for murder, being really guilty of that murder is only about 1999 to 1. Scarcely a single case of murder, where the prisoner has been able to employ distinguished counsel, has ever been tried but those counsel have enumerated to the jury scores of cases that are on record, where men that had been tried, convicted, sentenced and actually hung for murder, were subsequently proved to have been entirely innocent of the crime laid to their charge. I am satisfied, on a careful examination of the facts, that out of the whole number of men actually hung for murder, somewhere about 1 in every 2000 were innocent of the crime for which they suffered. Consequently, upon this supposition, the chance of any one supposed murderer, taken indiscriminately from the whole mass of men actually hung for murder, being in reality guilty is only $\frac{1999}{2000}$, or, in popular language, the odds are only 1999 to 1 that he is guilty. And yet men are every day hung for murder when the moral certainty of their guilt is demonstrably very much less than the moral certainty of the oak-apples that I was experimenting with having been produced by the gall-flies that I placed upon a particular bough of a particular oak in the preceding autumn!

The third black oak, visited on May 21, 1865—which was the small one—was absolutely loaded down with galls, and I estimated their number at 50 or 60 at least. At this early period all these galls were still small and immature, and it was necessary to leave them for a week or two upon the tree to ripen and mature.

On June 5th, 1865, I climbed the small gall-bearing black oak, and stripped it of every gall that I could see. From it I harvested only 18 normal *spongifica* galls, exclusive of 2 or 3 that had been destroyed by lepidopterous larvæ, and about 40 specimens of a particular form of gall (*Q. pseudotinctoriæ*, Walsh) which occurs commonly but sparingly among the normal *Q. spongifica* galls, and also, in a slightly modified type, upon red oaks infested by the *Q. inanis* gall. For a long series of years this *Q. pseudotinctoriæ* gall has been a great puzzle to me; for, whether obtained from black oak or from red oak, although I have bred from hundreds of them, and have kept them on hand for years, I have invariably bred nothing from them but great numbers of a very large and very handsome *Chalcis* fly, belonging to the *Pteromalides* with concealed ovipositors, which I have never reared from any other gall, and a few stray specimens of such *Chalcis* flies (*Callimome* and *Eurytoma*) as I have bred also from the normal *Q. spongifica* galls. My friend Baron Osten Sacken, to whom I had before this period communicated this peculiar form of gall, suggested that it was a true *Q. spongifica* gall, modified by the action of the parasite that inhabited it; and the negative fact that I could never breed anything but parasites from it, after experimenting with hundreds of specimens in three or four different years, compels me to acquiesce in this most anomalous and, so far as I am aware, unprecedented conclusion. The gall in question never exceeds 0.85 inch in diameter, while the normal *Q. spongifica* gall often attains a diameter of 1.75 inch, and is shaped like the normal gall, except that it is often studded outside with sharp prickle-like tubercles similar to those of the exotic *gallæ-tinctoriæ* gall—whence the name that I have given it. The central cell is round and about 0.20 inch in diameter, with an external crust which is only about 0.02 inch thick, instead of forming a dense woody mass as in the normal form. The external crust of the gall itself is similar to that of the normal gall; but, instead of its being connected with the central cell by homogeneous spongy matter, with a few subobsolete slender radiating filaments among it, as in that gall, it is connected with the central cell solely and exclusively by dense, opaque, coarse, whitish cottony fibres, radiating from the central cell, as in the *Q. inanis* gall, but differing widely from those of that gall by being very much coarser, by being cottony instead of smooth, and by being placed so close together as to occupy the whole space between the cell and the external crust of the gall, instead of being separated from each other by very wide interspaces. On my cutting into 24 galls that remained unbred from, on this 17th day of March, 1869, out of the above-mentioned lot of about 40 *Q. pseudotinctoriæ* galls harvested June 5th, 1865, eight of them were found to contain the dead Pteromalidous imago already spoken of, seven what was probably its mature dead larva, one what was probably its mature dead pupa, one the pupal shell of a ♀ *Callimome*, one a *Eurytoma studiosa* ♀, Say, and in six the tenant of the cell must have perished in early life, for in these six the central cell was empty.

On the supposition of the peculiar character of the *Q. pseudotinctoriæ* gall being caused by the action of the large Pteromalidous parasite that generally, but not always, inhabits it, and never inhabits the normal type of gall, it may be asked how it happens that this very same *Q. pseudotinctoriæ* gall sometimes produces the same species of green *Callimome* which is commonly bred from the normal gall, and occasionally a *Eurytoma*, which is also bred occasionally from the normal gall? I can only suggest that, in these two latter cases, the *Callimome* and the *Eurytoma* are parasitic upon the large Pteromalidous parasite, and that the peculiar character of the gall was determined in the first instance by the Pteromalide. The *Chalcididæ* are, to a much greater extent than is commonly supposed, secondary and not primary parasites; and in the case of the Joint-worm Fly (*Isosoma hordei*, Harris) we have an instance of a Eurytomidous Chalcidian being preyed upon parasitically by three other Chalcidians—one a *Torymus*, a genus closely allied to *Callimome*, and the other two belonging to the *Pteromalides* with short ovipositors.

From the 18 normal *Q. spongifica* galls, obtained on June 5th, 1865, as specified above, from the small black oak, I bred on June 11th, 1865, one *C. q. spongifica* ♀, and another ♀ of the same type on June 14th, 1865. On cutting into the remaining 16 galls, on October 15th, 1865, I obtained five living *C. q. aciculata*. Thus it results that *q. aciculata* generates sometimes *q. aciculata* and sometimes *q. spongifica*.

Lest it should be supposed that there was any reasonable probability of this small black oak having been attacked by any other gall-fly producing upon black oaks the *Q. spongifica* gall besides those that I placed on it myself in the preceding autumn, it is proper to add here that it grew on the Bluffs, where black oaks are very scarce, and that I am confident that there is not another black oak within a quarter of a mile of it. So rare, moreover, are the galls *Q. spongifica* upon the Bluffs, that in the course of six years' careful observation I have only noticed there three or four black oaks bearing these galls, and even then there were only from 3 to 6 on a tree; whereas on the sandy bottom land, which swarms with black oaks, these galls are comparatively quite common.

If, however, we choose to believe that the very same insect that produces the *Q. inanis* gall also produces the *Q. spongifica* gall, then the above mode of reasoning will not apply with such force; for the *Q. inanis* gall, and the red oak on which it grows, are nearly as common on the Bluff as the *Q. spongifica* gall, and the black oak on which it grows, are on the bottom land. Still, even upon this hypothesis, it is exceedingly improbable that *Cynips q. inanis* should have attacked this particular small black oak in the spring of 1864; for, 1st, I know that this tree bore no oak-apples for many years previous to 1865; 2nd, there were no red oaks growing anywhere within two or three hundred yards of it, the few oaks that grew near it being either white oak or bur oak, which never produce either the *Q. spongifica* or the *Q. inanis* gall; 3rd, I noticed that, in the spring of 1866, this very same small black oak swarmed again with the *Q spongifica* gall, almost as abundantly as in the spring of 1865. Doubtless these galls had been generated by gall-flies that escaped from some of the galls before I harvested them on June 5th, 1865, or from green galls that had previously fallen off the tree on to the ground, as they will very often do in very great numbers when there is a high wind blowing, and be carried along the surface of the ground for hundreds of yards by the action of the wind; 4th, if we assume that the two galls that produced *C. q. spongifica* June 11th and 14th, 1865, had been generated by *C. q. inanis*, and that only the five galls that produced *C. q. aciculata* October 15th, 1865, had been generated by the *C. q. aciculata* that I placed on the small black oak in the autumn of 1864, how does it come about that the *Q. spongifica* gall is so very rare on those very Bluffs where the *Q. inanis* gall is so common? Surely if *C. q. inanis*, bred from red oak, is capable of generating the *Q. spongifica* gall on black oak, the *Q. spongifica* gall ought to be as numerous on the Bluffs, in proportion to the number of black oaks growing there, as it is on the sandy bottom land, whereas it is no such thing. 5th, on the hypothesis of *C. q. inanis* generating *Q spongifica* galls, there again recurs the inevitable question, "Why does *C. q. inanis*, if it is specifically identical with *C. q. spongifica*, produce swarms of an autumnal dimorphous ♀—*C. q. aciculata*—on the black oak, and none at all on the red oak?" Or shall we take refuge in the anomalous hypothesis that one and the same bisexual species, variously known as *C. q. spongifica* ♂ ♀ and *C. q. inanis* ♂ ♀, produces two such entirely different galls as *Q. spongifica* and *Q. inanis* upon black oak and red oak respectively, the same type of gall being always found upon the same species of oak; and that a distinct agamous species—*C. q. aciculata* ♀—generates upon the black oak, galls which are utterly undistinguishable from those of *C. q. spongifica* upon the same oak, and which occur upon the same oak promiscuously intermixed with these last galls in scores of different localities, and yet that this agamous species never under any circumstances generates any galls at all—whether of the *Q spongifica* type or of the *Q. inanis* type—upon the Red Oak? To such a supposition I can only oppose what, from long experience with galls of all kinds, I consider as an established axiom; namely, that the characters of the gall depend entirely upon the insect that makes it, and in no wise upon the plant, or the particular part of the plant, from which it grows. Consequently, I could as readily believe that a cow could produce sometimes a calf and sometimes a lamb, as that *Cynips q. inanis* could produce sometimes a *Q. inanis* gall upon Red Oak, and sometimes a *Q. spongifica* gall on Black Oak. If it produced any gall at all upon Black Oak, instead of upon Red Oak which is its normal habitat, it would inevitably, in my opinion, produce a gall having all the characters of the *Q. inanis* gall that is commonly found upon Red Oak.

I am well aware that much of the above reasoning will lack its due weight with the reader, because he has not, as I have, watched particular trees in a grove of Black Oaks swarming with oak-apples for year after year, while the neighboring trees bear none at all, or only a few scattering specimens, and because he has never seen, as I have twice seen with astonishment, that even a particular bough on a particular tree will bear numerous oak-apples for year after year, while the rest of the tree will bear none at all. Hence I have derived a profound conviction that the gall-flies that make these oak-apples, although they have full-sized wings, yet scarcely ever use them; whereas persons who are unacquainted with these insects would naturally suppose that they fly about the woods as freely as a bee or a butterfly. Out of the thousands that I have bred in my office, I never knew a single individual, whether of the vernal or of the autumnal type, to take wing at all; and only on one or two occasions, when I have been placing them upon oaks to experiment on the laws of their reproduction, have I seen one of them take wing, and then it would only fly a yard or two.

On June 11th, 1865, I gathered the four galls off the large gall-bearing Black Oak previously referred to. From these I bred no *q spongifica* at all; but on cutting into them on October 15th, 1865, I obtained therefrom three living *C q. aciculata*.

On October 16th, 1865, having now in my possession two lots of living and lively *q. aciculata*, one consisting of 5 ♀ and the other of 3 ♀, that I knew to be generated by *q. aciculata* of the preceding season, I determined to see whether they would all or any of them continue to generate *q. aciculata* in the succeeding season, or whether, as had been the case with two of their predecessors, they would revert one or more of them to *q. spongifica*. I therefore placed them, each lot by itself, on two fresh isolated black oaks, that I knew to have not been previously infested by these galls, for several years back at all events.

On May 31st, 1866, I gathered off one of these two black oaks, upon which I had colonized the 5 *q. aciculata* in the preceding autumn, 5 *Q. spongifica* galls, four of them badly eaten by lepidopterous larvæ, and only one in a perfect state. They were at this date too young and immature to gather with safety, but I feared to leave them longer on the tree on account of the caterpillars, which will very frequenly eat away all the sponge and starve out the larva in the central cell. From this lot of 5 galls, generated by 5 *C. q. aciculata* in the preceding autumn, which 5 *C. q. aciculata* had themselves been generated in the autumn next but one preceding by the 8 *C. q. aciculata* that I had colonized upon another isolated black oak, I bred, on the 14th and 17th of the ensuing June, 2 *Cynips q. spongifica* ♀. The remaining 3 galls produced nothing.

The other isolated Black Oak, upon which I had colonized the 3 *q. aciculata* in the preceding autumn, bore 2 *Q. spongifica* galls; but they were so high up on the tree, and placed so near the extremity of a long slender bough, that I was unable to harvest them. I was the more unwilling to expend time, trouble or money on this account, as I saw that one of them at all events, and perhaps both, were very badly eaten by caterpillars.

The general result of the above experiments, as the reader will perceive, is that the agamous autumnal ♀ form of this *Cynips* sooner or later reproduces the bisexual vernal form. I have tried many more such experiments—some of which resulted successfully, but most of them unsuccessfully, sometimes from the nefarious propensity of a great variety of

Noctuadous and Tortricidous larvæ to devour the green galls, and sometimes from the trees on which I was experimenting being afterwards mercilessly lopped of their main limbs, or cut down to the ground, by their unprincipled proprietors

On one occasion, being desirous of attaining some practical proof that *q. spongifica* could generate *q. aciculata*, as well as the reverse, I strung a chaplet of some 50 or 60 green *Q. spongifica* galls, gathered before it was quite time for *C. q. spongifica* to come out of them, upon a particular bough of a large isolated black oak, known not to bear these galls. Luckily no mischievous person discovered this deposit, and in the course of the summer I removed it, so as to preclude the possibility of any *C. q. aciculata* coming out therefrom and generating galls upon this tree. The next spring I was delighted to see numbers of oak-apples upon the particular bough on which I had strung the chaplet of oak-apples, and upon one or two of the adjoining boughs, but none at all upon the rest of the tree. Unfortunately, however, the caterpillars destroyed most of them before they were fit to gather, and I only harvested 6 galls, many of them in poor order. In 4 of these the gall-maker was destroyed by parasites, and the remaining 2 were barren; so that all that this experiment proved was that *q. spongifica* was a gall-maker, and not, as Dr. Reinhard suggests may possibly be the case, an inquiline.

Upon another occasion, wishing to repeat the very same experiment as the last, I strung another such chaplet of green oak-apples upon a large black oak, which I had noticed for years to grow in a very retired spot upon the Bluffs, with not another oak of the same species within a quarter of a mile of it, and which, as I was quite certain, had produced no *Q. spongifica* galls for many years, if it had ever produced any at all. Unfortunately for the interests of science, the German citizens of Rock Island determined about this time to have a grand field-day in the woods; and as ill luck would have it, of all places in the world they must needs select my quiet retired spot for their Terpsichorean exercises. The result may be readily guessed. Of course my chaplet of oak-apples was speedily discovered by some roving Teuton; of course the conscript fathers of the assembly held a solemn council as to what might be the meaning of this dire and awful prodigy; and of course it was unanimously voted that the "spooks" had placed the oak-apples there for the purpose of souring all the lager beer, breaking the strings of all the fiddles, and generally inflicting all manner of horrible calamities upon the festive crowd. Therefore the wizard spell must be broken, and the "spooks" must be balked in their atrocious and malignant purpose. I do not know how the "spooks" felt upon this occasion, but I know how I felt myself the next morning, when I visited that venerable old oak and saw the shattered fragments of my galls trampled into the dust beneath its umbrageous boughs!

I may say in one word—to resume the dignified dullness of a purely scientific memoir—that, so far as my experiments proved anything at all, they all proved the same thing: namely, that *Cynips q. aciculata* generally reproduces itself, but often reproduces *Cynips q. spongifica;* and consequently, as I originally maintained, that it is a mere dimorphous ♀ form of the latter. It may perhaps go on reproducing itself for 12, 20 or even 50 years; but that every *q. aciculata* will eventually, in some year or other, generate *q. spongifica*, I have no more doubt than that the sun will rise on the morning of January 1st, A.D. 1900.

In the lepidopterous *Psyche helix*, as I have been assured by Dr. Hagen, out of thousands of specimens bred within the last ten years by Prof. Siebold, all were females; but in 1867 the male was discovered to occur, though in very small numbers, by Prof. Clauss. May it not be the case that Hartig's agamous *Cynips*, and certain N. A. *Cynips* which hitherto have only occurred in the female sex—for example, *Cynips q. podagræ*, Walsh, of which I have bred in early spring about two thousand females without a single male among them, and have in vain attempted to procure a bisexual form in the preceding autumn—may, sooner or later, perhaps not till after the expiration of many, many years, produce a generation of males? In the Cynipidous genus *Rhodites* the males are for the most part extremely rare. In certain species of the Pseudoneuropterous genus *Psocus—Ps. bipunctatus* (Europe) and *Ps. variegatus* (Europe)—"you may," in the words of Dr. Hagen, "find thousands of females together and not a single male." (*Proc. Ent. Soc. Phil.* II, p. 168.) Many other such cases have been recorded by entomologists, as regards insects belonging to many different Orders. And from such a state of things it is but a single step to the non-production of males for one, two or more years. The rarity of males, however excessive it may be, even if it amounted to but a single male to a billion of females, is merely a question of mode and degree. But the permanent non-existence of males in any species belonging to a Class which, like that of Insects, is almost universally bisexual, would be such a violation of the analogies of Nature as I am loath to believe in.

To return from this long, and I fear somewhat tedious, digression: No man can distinguish between the imago ♂ ♀ of *Halesidota tessellaris*, Sm. & Abb., the larva of which feeds upon a great variety of trees, but never on the Sycamore (*Platanus*) and that of *H. Harrisii*, Walsh, the larva of which feeds exclusively on the Sycamore, and dies if transferred to trees upon which the other larva flourishes; and yet these two larvæ are invariably as different from each other as light is from darkness.* Many more such cases might be quoted, but one such is enough to prove the importance of attending to the larval history of insects.

Dr. Fitch long ago asserted that the common imported Apple-tree Bark-louse (*Aspidiotus conchiformis*, Gmelin) occurred also upon a N. A. dogwood (*Cornus sericea*); and he sent specimens of both insects to the English entomologist, John Curtis, who likewise pronounced them identical. (*N.Y. Rep.* I, p. 34.) I have recently been assured by Dr. Hoy, of Racine, Wisconsin, that to his knowledge this same bark-louse has existed in the neighborhood of Racine upon the same species of dogwood for the last twenty years and upwards, and that "there is not the least shadow of a doubt that the Dogwood was affected by this bark-louse long before any white man settled in Wisconsin." Now, it is only within the last few years that the imported Apple-tree Bark-louse has worked its way into Wisconsin from the Eastern States: consequently, the bark-louse that inhabits the dogwood can scarcely be capable of living upon the apple-tree, for if it had been so capable it would surely have attacked the Wisconsin apple-trees long ago; whence it follows that the two forms must in all probability be essentially distinct in their digestive organization, and consequently that they are distinct species. And yet, on the comparison of cabinet specimens of each, the apple-inhabiting form and the dogwood-inhabiting form were pronounced to be the same identical species by no less an authority than John Curtis! The real truth of the matter I believe to be, that in no one single case can the same species, either of Bark-louse (*Coccidæ*) or of Plant-louse (*Aphidæ*), exist upon two species of plants which, like the Apple and the Dogwood, belong to distinct botanical families; although, on the other hand, many other families of insects are notoriously polyphagous.

What candid entomologist, who has worked much upon any particular Order, will not allow that there are certain genera where it is often almost or quite impossible to distinguish species by the mere comparison of cabinet specimens of the imago? Lœw and Osten Sacken have said this of the genus *Cecidomyia* in Diptera; Osten Sacken of two other Dipterous genera, *Sciara* and *Ceratopogon;* Norton of the genus *Nematus* in Hymenoptera; and Dr. LeConte lately assured me that, although when he was a young man he thought himself able to discriminate, in the closet, between the different species of *Brachinus* in Coleoptera, he now considered it quite impracticable to do so with any degree of certainty. And yet who doubts the fact of the existence, in

* See my papers on Phytophagic Species already referred to.

North America, of very numerous distinct species of *Cecidomyia*, of *Sciara*, of *Ceratopogon*, of *Nematus*, and of *Brachinus*.

Upon the same principle I strongly incline to believe that the 17-year form of the Periodical Cicada (*C. septemdecim*, Linn.) is a distinct species from the 13-year form (*C. tredecim*, Riley), although it has been impossible for me, on the closest examination of very numerous specimens, to detect any specific difference between these two forms.* It is very true that the 13-year form is confined to the more southerly regions of the United States, while the 17-year form is generally, but not universally, peculiar to the Northern States; whence it has been, with some show of plausibility, inferred that the 13-year form is nothing but the 17-year form accelerated in its metamorphosis by the influence of a hot southern climate. But as these two forms interlock and overlap each other in various localities, and as it frequently happens that particular broods of the two forms come out in the same year, we should certainly expect that, if the two forms belonged to the same species, they would ocasionally intercross, whence would arise an intermediate variety having a periodic time of 14, 15 or 16 years. As this does not appear to have taken place, but, on the contrary, there is a pretty sharp dividing line between the habits of the two forms, without any intermediate grades of any consequence, I infer that the internal organization of the two forms must be distinct, although externally, when placed side by side, they are exactly alike. Otherwise, what possible reason could there be for one and the same species to lie underground in the larva state for nearly 17 years in one county, and in the next adjoining county to lie underground in the larva state for scarcely 13 years? I presume that even the most bigoted believer in the old theory of species would allow that, if it can once be proved to his satisfaction that two apparently identical forms are always structurally distinct, whether in their external or in their internal organization, they must necessarily be distinct species.

On the other hand, I firmly believe that many perfectly distinct forms, which at one time passed current, or which even now pass current, as true species, are in reality mere dimorphous forms of one and the same species. We find a good example of this in the dimorphous ♀ Cynips, *Q. aciculata*, O. S., which has been already treated of at great length. We find another good example of the same thing in *Cicada Cassinii* ♂ ♀, Fisher, which is sufficiently distinct from the Periodical Cicada to have been classified as a distinct species, and yet never occurs except in the same year and in the same locality as this last, and what is more extraordinary still, is found not only along with the 17-year form (*C. septemdecim*), but also along with the 13-year form (*C. tredecim*). Now, if *Cassinii* were a distinct species, and not, as I believe it to be, a mere dimorphous form of *C. septemdecim* and *C. tredecim*, the chances are more than a million millions to one against its always coinciding with the other two forms, not only as to the particular locality but as to the particular year of its appearance.

It has been urged in opposition to the above view, by an entomological friend of great scientific eminence, that dimorphous forms only appear in one sex. I believe that they very frequently appear in both sexes; but of course, in the majority of instances, they are then very naturally accepted as distinct species. Suppose, for example, that there were such a thing as a ♂ as well as a ♀ *Papilio Glaucus*, Linn., who would then ever have dreamt that *Glaucus* was a mere dimorphous ♀ form of *Turnus*? It was precisely the absence of the ♂ form corresponding to ♀ *Glaucus*, that first led entomologists to doubt the possibility of *Glaucus* being a true *bona fide* species; and it was upon similar grounds that Mr Wallace established the existence of several such dimorphous and trimorphous Papilios in the Malay Archipelago. But in point of fact there do really exist, and have long been known to exist, many dimorphous forms which are not confined to a single sex. It is only necessary to mention, as good illustrations of such a state of things, the long-winged and short-winged forms common to both sexes of many Orthopterous, Heteropterous and Homopterous genera, such as *Gryllotalpa*, *Nemobius*, *Cynips* (*Teras*), *Pezomachus*, *Choreius*, *Hydrometra*, *Gerris*, *Velia*, *Prostemma*, *Pyrrhocoris*, *Pterotmetus*, *Bruchomorpha*, *Delphax*, etc. Nor are such phenomena peculiar to the Class of Insects. Mr. Wallace, in his admirable Paper *On the Malayan Papilionidæ*, remarks that he "met with one case of a bird, a species of Lory (*Eos fuscata*, Blythe), clearly existing under two forms, since *both sexes* of each were obtained from a single flock." (*Trans. Linn. Soc.* XXV, p. 10.) And the albinism and melanism which are so common among many mammals and birds, and which may be considered as modified types of dimorphism, are well known not to be confined to either sex.

On the whole, I think we may conclude with perfect safety, that the species of insects as limited in the books are merely provisional; that on the one hand many forms which are in reality specifically distinct are confounded together by the closet-naturalist, because his cabinet specimens of the imagos exhibit no distinctive characters whatever; and that on the other hand many forms, which are in reality merely dimorphous types of one and the same species, are pronounced by him to be distinct species.

Of course, if we choose to assume that no two species can possibly be distinct unless they are externally distinguishable in the imago, and that all forms that are externally distinguishable in the imago are distinct species, then everything that has been said above will go for nothing, and the whole doctrine of dimorphous forms, and also, I might add, of secondary sexual distinctions, falls to the ground. But—luckily for the interests of truth—assumptions are not proofs; and even, if we assume that the sky is going to fall to-morrow, it by no means follows that we shall then catch any considerable number of larks.

[*To be continued.*]

*For an excellent statement of the facts bearing upon this curious question, see a Paper by Mr. Riley, the State Entomologist of Missouri, in No. 4 of the AMERICAN ENTOMOLOGIST, and a still more complete one in his First Annual Report.

AN ELECTRICAL INSECT.—You are well acquainted with the history and properties of the *Raia torpedo* and *Gymnotus electricus;* but I dare aver have no idea that any insect possesses their extraordinary powers; yet I can assure you, upon good authority, that *Reduvius serratus*, commonly known in the West Indies by the name of the "Wheel-bug," can, like them, communicate an electric shock to the person whose flesh it touches. The late Major-General Davis, of the Royal Artillery, well known as a most accurate observer of Nature, and an indefatigable collector of her treasures, as well as a most admirable painter of them, once informed me that, when abroad, having taken up this animal and placed it upon his hand, it gave him a considerable shock, as if from an electric jar, with its legs, which he felt as high as his shoulder; and dropping the creature, he observed six marks upon his hand where the six feet had stood.—*From Kirby and Spence's "Introduction."*

REMEDY FOR ONION-WORM.—Two of our exchanges have asked for a remedy for this pest. Boiling water is the thing.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

NOTES FROM WILKINSONVILLE, MASS., *July* 28, 1870.—Allow me to express my deep sympathy in your efforts to diffuse valuable instruction. I regard such publications as the *American Naturalist*, the AMERICAN ENTOMOLOGIST AND BOTANIST, and the like, as containing the true gospel of salvation. My soul is vexed from day to day because the writers of unrighteous fiction are so popular, while the devotees at the shrine of science, and the promulgators of God's truths, are, to such a degree, neglected—their writings unsought—unread. Yet not wholly so. I rejoice to believe that the number of students in the school of nature is rapidly increasing. And I devoutly pray and hope that the beauties and attractions of nature may be so unfolded and presented by such men as yourselves, that the youth of America may be turned from the unprofitable, innutritious, and demoralizing food of fiction, to the bread and water of a true life.

What few plum trees have survived the black-knot, have, for these dozen years, had their fruit almost entirely destroyed by the Curculio; and so have the cherries; while apples, by the same Turk, *not by the Apple Curculio*, have, from year to year, been greatly injured. I have frequently counted ten and twelve crescent cuts on the same apple. Though it is generally believed that this weevil does not mature in the apple [it undoubtedly does, as we have abundantly proved—ED.], it penetrates sufficiently to cause many to fall early, and others to become irregular in shape, and to contain hard and discolored markings where the larvæ have penetrated. The American Tent-caterpillar (*Clisiocampa americana*) of spring was quite scarce, but the Fall Web-worm (*Hyphantria textor*) is unprecedently numerous. They commenced hatching this year uncommonly early—in the first half of July—and from appearances are now, 25th, nearly all out. I have entirely removed and exterminated them from an apple orchard of one hundred and fifty trees. The mother moth deposits the eggs on a leaf near the end of a twig. As soon as they hatch they begin to eat and spin a web over them for protection. This betrays them. As soon as the web is seen, I sever the twig with pruning shears attached to a pole and having an operating cord. Unlike the Tent-caterpillar, this eats only in its tent, extending it over its whole foraging ground. If the twig is severed a little below the web, every caterpillar falls with it. If the twig falls on bushes or shrubbery, the larvæ, being somewhat indiscriminate feeders, may survive and mature; but falling on grass ground they generally perish, never, like the Tent-caterpillar, returning to the tree. I have recently found a twig of worms among some luxuriant Witch-grass (*Triticum refens*), where the worms seemed to survive by extending their web over, and eating the grass. Such cases are extremely rare. J. B. HARTWELL.

SALT MARSH CATERPILLAR—*Covington, Ky., July* 28,'70.—I was not a little surprised last night to see a fine fresh ♀ specimen of *Spilosoma acrea* come fluttering into my lamp. Its popular name, "Salt Marsh Caterpillar," and all that I have ever seen about it, had led me to believe that it was peculiar to the coast region. There are no salt marshes or even salt springs nearer to this point, so far as I am aware, than the Kanawha salines. There is a small, faintly mineral spring about four miles from here (known as Latonia Springs), and the Big Bone Springs are distant about twenty miles, but both are more strongly impregnated with other minerals than with salt.

It was a perfectly fresh specimen, scarcely a scale ruffled, and, judging from its flight, it had scarcely learned to fly; and, thefore, could not have traveled far. It corresponds with Harris's figure and description (Inj. Ins.), and with specimens in my collection sent me from the region of the Gulf of Mexico, except that the spots on the fore wings are larger, more distinct, and there are a few more of them, and there is a difference in the spots on the hind wings. Scarcely any two specimens are alike though, in this respect, I believe.

Is it known so far inland? If so, it must feed on something else than the salt marsh vegetation. Harris says that the pupa is sometimes carried into the interior in hay, but the importation of salt marsh hay into this region would be worse than carrying coals to Newcastle, and stranger than the appearance of the insect.

V. T. CHAMBERS.

[During the last half of July this moth constantly flies into the light of our office, and it is nearly as common as its relative, the Yellow Bear (*Spilosoma virginica*), in many parts of the West, where there are no signs of salt marshes. It feeds on the different grasses, as well as many herbaceous plants, and we have reared it on Sunflower, Convolvulus, Petunia and Willow.—ED.]

MORE ABOUT THE "COW-KILLER" (*Mutilla coccinea*)—*Clarksville, Texas, Aug.* 25, '70.—I have been endeavoring for the last two years to study the habits of the "Cow-killer" without arriving at anything definite, and have been inclined to consider it a friend. But lately my mind has undergone a change, from the following facts: A few days since, while in my apiary watching a hive at work, I observed a very large female (Cow-killer) running over a Flowering Peach tree that overshadowed the "gum." Finally she came down and entered the hive. I tilted the "gum" to see what she was doing, and found a number of bees trying to dislodge her, but to no purpose. Whenever she could shake them off sufficiently she would continue her march over the bottom board in search of food, picking up fragments of comb and young bees, and occasionally sending a bee to its final account with her formidable sting, and caring but little for their rage and fury; encased as she is in her impenetrable armor, she bids defiance to the puny stings of bees. Finally I had to come to their aid. Since then I have had to free several other hives from these depredators. A. H. R. BRYANT.

BROOD IV OF THE PERIODICAL CICADA—*Savannah, Tenn., Sept.* 2, '70.—The 13-year Brood of the Periodical Cicada mentioned in your first Missouri Report (your Brood IV) appeared, according to prediction, in northwestern Florida this year, extending northward over Alabama and a good portion of eastern Mississippi, and into Tennessee as high as this point. I think I wrote you when they were here. They were not in great numbers at any point. I was at Mobile at the time of their appearance there, and found them singing quite merrily in the woods below the city. I do not know whether they reached Georgia or not this year, nor do I know anything about their appearance there last year. By this mail I write a friend in Macon with reference to the matter, and shall forward you his reply as soon as received.

J. PARISH STELLE.

SEVENTEEN-YEAR CICADA AT GEORGETOWN, OHIO, IN 1871—*Georgetown O., July* 2, 1870.—I send you herewith three Cicadas. They were taken from the ground a foot or more below the surface, in hard clay, on the 17th of June. I had eight, and put them in a flower pot not quite full of loose dirt. I did not think they would get out, but the same P. M. one of them was found on the outside, and the most of the liveliest ones had decamped. I put the one back several inches below the surface, and covered the pot with a tin-pan. This morning I examined the pot, found the three I send on the surface, two of them dead, and the third not very active; it may not live till it arrives. We had a large supply of the fellows in 1854, and quite plenty of them once since, but I am not certain as to time. We have a few pretty often, but I am not right thoroughly posted as to the different broods, etc., and not having kept an accurate record of time of appearance, am in the dark as to where these belong. Last year many were dug up in this vicinity in the pupa state.

THOS. W. GORDON.

[The pupæ belong in all probability to the 17-year Brood of the Periodical Cicada, which we have predicted will appear in 1871 around the head of Lake Michigan, and for some distance east, west, and south. (See Brood III, A. E., Vol. 1, p. 68=Brood V of First Missouri Entomological Report, p. 32). This Brood is not recorded as occurring in Ohio, and if it appears there in 1871 we shall have another link in the chain. We hope our correspondent will keep a look-out for it, and will likewise endeavor to trace its appearance at intervals of seventeen years as far back as possible—ED.]

NEBRASKA BEE-KILLER—*Champaign, Illinois, Aug.* 6, 1870.—I send you an insect by mail today, in a glass bottle, that has interested me very much for three or four years. I am hardly able to decide whether it is a friend or a foe. My attention was first called to it by seeing several around my team during summer. Supposing them to be a new horse-fly, I watched to see one bite, but was finally rewarded by seeing it pounce upon a Green-head (*Tabanus lineola*, Fabr.) It settled itself on my sleeve, and soon had transferred the contents of Mr. Green-head's body inside its own, by sucking the juices out by means of its stout proboscis. I saw this operation repeated many times. The present summer I have seen them dozens of times, often five or six around my team, and have always noticed that in an hour or so after they appeared no more horse-flies were to be found. I have also seen them "sucking" house-flies, Lady-birds, Chinch-bugs, several moths, and have also seen them eat each other. The one sent you had just captured a Honey-bee, for which offense I made a martyr of him (or her) for the benefit of science. H. J. DUNLAP.

[The insect is a ♀ Nebraska Bee-killer (*Promachus Bastardii*, Loew.), an account of which was first given by Dr. Fitch in his Ninth Report, and subsequently by ourselves in the Missouri Reports.—ED.]

DECORATIVE LARVÆ—*Boston, Mass.*—On page 205 of the present volume you state that the larva of your *Aplodes flavilineata* decorates itself in the same manner as *Aplodes rubivora*. I think you must have misconstrued my former letter; for, to the best of my present recollection, the larvæ of *flavilineata* which were found on *Achillia millifolium* had no spines by means of which to decorate themselves. Last season I raised a few specimens of the Imported Currant-worm (*Nematus ventricosus*), which is an entirely new insect in this section, so far as my knowledge goes. In three instances the males spun a yellow cocoon, while that of the females was quite dark.

PHILIP S. SPRAGUE.

[We certainly must have misconstrued our correspondent's former letter, which referred to larvæ of *Aplodes flavilineata*, but we hope that Mr. S. will, by future observation, endeavor to settle the question beyond all doubt as to whether or not it decorates itself. We do not believe the depth of color in the cocoon of *Nematus* can be relied on as a sexual character; for, both in that genus and in the genus *Lophyrus*, we have known the greatest variation, both in size and depth of color, to take place in cocoons which subsequently gave out the same sex.—ED.]

THE RAPE BUTTERFLY; OUR NEW CABBAGE PEST.—This most destructive insect (*Pieris rapæ*, Skrank, Figs. 48, 49 and 50 of this Vol.) is fully realizing our prophesies. It is spreading with wonderful rapidity towards the West and South. We recently found it flitting around the truck and fruit stands of New York, Albany, Troy and Philadelphia. No wonder we have more than our due allowance of noxious insects in the Mississippi Valley. They advance towards us from all parts of the country. Salt is the common remedy; but Mr. Quinn, at a late meeting of the N. Y. Institute Farmers' Club, gave his experience as follows:

"I have tried no less than fifteen different powders or decoctions, and find the best result from the application of a mixture composed of twenty parts sulphate of lime, one part carbolic powder, and three or four parts of quicklime. This I sprinkle in small quantities upon the leaves and parts affected, making the application in early morning before the dew is off, or after a shower. Frequent repetition is sometimes necessary.

CHANGE OF ADDRESS.—The entomological editor has removed from the country to Room 29, Insurance Building, St. Louis, on the southeast corner of Fifth and Olive streets. There he will be found ready to give any information in his power, and glad at all times to see his friends. All letters should in future be addressed accordingly.

PARIS GREEN FOR THE CURCULIO.—G. M. Smith, of Berlin, Wis., wrote an article to the St. Joseph (Mich.) Horticultural Society, recommending Paris Green for the Plum Curculio. Even if the application of such a poisonous drug on large trees were practical, it would never succeed in killing one Curculio in a hundred. Paris Green kills the leaf-eating beetles by being taken internally with the leaves; but the Curculio, with its snout, prefers to gouge under the skin of the fruit, and only exceptionally devours the leaves. Yet, notwithstanding the palpable absurdity of the remedy, it has very generally passed from one journal to another without comment.

ENTOMOLOGICAL COLLECTIONS.—We are glad to learn that the members of the popular and flourishing Horticultural Society of Alton, Ills., have resolved to prepare a collection of such insects as interest the farmer and fruit-grower. This collection is to be in the custody of the Chairman of the Committee on Entomology; and we believe that Mr. J. R. Muhleman, of Woodburn, a good entomologist and an excellent observer, now occupies that position. Let other societies follow the example. There is no better way of familiarizing the members with the different injurious and beneficial insects which affect their interests.

☞ We thankfully acknowledge the receipt of several complimentary tickets to Agricultural Fairs, and of numerous pamphlets and Premium lists, which, for lack of space, we cannot enumerate.

☞ The article on "How to Collect and Study Insects" arrived too late for insertion in this issue.

ON OUR TABLE.

RECORD OF AMERICAN ENTOMOLOGY FOR THE YEAR 1869—*Naturalists' Book Agency, Salem, Mass.*—This little work came to us about a month ago, its publication having been unavoidably delayed. We are glad to see that it is received with favor, and that it is to be continued. No entomologist can afford to do without it.

The number of American entomologists whose articles or notes are referred to in the *Record* is fifty-two; while three hundred and thirty-five new species of North (and Central) American insects have been described in American journals during the year 1869.

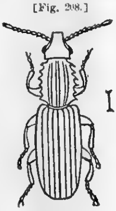
ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

Beetles working in Wheat, Oats and Rye; the Grain Silvanus—*M. H. Boye, Coopersburg, Lehigh Co., Pa.*—The little brown elongate beetles, about 0.09 inch long, and characterized chiefly by the last three joints of the antennæ being enlarged, and by having three prominent longitudinal carinæ, or narrow ridges, on the thorax above, and six pointed teeth each side, is known as the Grain Silvanus (*Silvanus surinamensis*, Linn.) We give an outline of it at Fgure 208. As the facts you record of its habits are interesting, we quote them in full. "This insect is called here the 'Red Weevil.' It spoiled much of my rye and wheat last fall, mainly by heat and moisture which it caused, though it also ate out a small portion of the end of the grain. Having removed the rye and wheat, I find that this pest has gone into the oats." This is in all probability an imported insect; and its specific name would indicate that it originally came from Surinam. It is a constant inhabitant of the stores and warehouses in Europe, and an excellent figure of it is found on Plate K of Curtis's Farm Insects. The best way to get rid of it, where the grain cannot be subjected to a killing heat, is to stack the grain a year or two until the insects are starved out of the barns, just as they lay by ships in the grain trade, or use them for other freight, when they once become infested with this insect, or with the true Grain Weevil (*Colandra granaria*).

[Fig. 208.]



Color—Brown.

Beetles in dried "English Currants"—*T. V. Munson, Astoria, Ills.*—The beetles which bred so abundantly in your dried English currants are the very same species (*Silvanus surinamensis*) referred to above in answer to Mr. Boye. Nothing seems to come amiss to it.

The same in Flouring Mills—*Stephen Blanchard, Oregon, Mo.*—The little brown beetles that have appeared in such countless numbers in your flouring mills are the very same species as the preceding. It has been in the country for many years, and is frequently mistaken for the "Weevil."

Insects named—*Jos. E. Chase, Holyoke, Mass.*—The large borer found in rotten wood is the larva of the Broad-necked Prionus (*Prionus laticollus*, Fig. 169, Vol. II.) Your beetles are as follows, the numbers omitted not named, because the specimens were either too much damaged to determine accurately, or because they are new to our cabinet and probably undescribed. The Curculionidæ have never yet been worked up, and very many of them are yet unnamed. You must in future observe the conditions published at the head of this department. Of those marked with a * we should like further specimens. No. 3, *Chamyrus cerinthia*, Heitz. No. 4, *Boros unicolor*, Say. No. 5, *Saprinus dimidiatipennis*, Lec. No. 6, *Tenebrio obscurus*, Fabr. No. 7, *Bolitobius cinctus*, Grv. (Nos. 8, 9, 10, 11, 12, 14 and 15 all missing.) No. 13, *Eros modestus*, Say. No. 16, *Heteraspis curtipes*, Melsh. No. 18, *Silvanus*, sp. ? No. 20, *Calligrapha multipunctata*, Say. No. 21, *Clytus leucozonus*,* Lop. and Gory. No. 22, *Listroderes caudatus*, Say. (Nos. 23, 24, 26, 27 and 29 missing.) No. 25, *Hister*, sp. ? No. 28, *Hydrophilus glaber*, Hbst. No. 30, *Telephorus bilineatus*, Say. No. 31, *Haltica pubescens*, Illig. No. 32, *Hydrophorus*, sp. ? Nos. 33 and 34, *Cryptocephalus venustus*, Fabr. No. 35, *C. lituratus*, Fabr. No. 36, *C.* sp. ? No. 38, *C. congestus*, Fabr. No. 37, *Colaspis*, near *puncticollis*, Say. No. 39, *Diabrotica vittata*. No. 40, *Hippodamia 13-punctata*. (Nos. 41, 42, 43 and 44 shaken off the isinglass and mixed up.) No. 48, *Hylobius confusus*, Kirb. No. 49, *Cymindis pilosa*, Say. No. 50, *Platynus obsoletus*, Lec. No. 51, *Sistena frontalis*, Fabr. No. 54, *Steledota geminata*, Say. No. 55, *Brontes dubius*, Fabr. No. 56, *Aphodius*, sp. ? No. 58, *Melasoma scripta*, Fabr. No. 59, *Cycocephala immaculata*, Oliv. No. 60, *Ancylocheira Nuttalli*, Lec. No. 63, *Hydrophilus mixtus*, Lec.

Carolina Sphinx—*Wm. R. Howard, Forsyth, Mo.*—Such is the large gray moth which you sent (*Sphinx Carolina*, Linn.), and which is the parent of the common Tobacco-worm. You should never send living moths loose in a box; they do not relish confinement, and generally batter themselves to pieces.

Insects clustered on Apple trees—*Robert L. Ham, Great Falls, N. H.*—The black-and-yellow marked insects which you find clustered or huddled together on the trunks of your apple trees, some without and others with wings, are the *Psocus venosus* of Burmeister. They feed on the lichens on the bark, and are therefore harmless.

Larvæ named—*T. W. Gordon, Georgetown, O.*—Your first larva is the "Saddle-back" (*Empretia stimulea*, see Fig. 36 of this volume). The green worm, covered with bunches of brush-like spines, is the larva of *Saturnia Io.* Both these larvæ have a stinging power. The white cocoons on the large potato-worm are the parasitic *Microgaster* cocoons we have so often referred to.

Mite Gall on Sugar Maple—*A. Furnas, Danville, Ind.*—The narrow yellow protuberances, in form reminding one of an old-fashioned ring-purse, and averaging about 0.25 inch in length, which cover the upper surface of the leaves of *Acer saccharinum*, are galls produced by mites (*Acari*). This gall is apparently undescribed, as are some other mite-galls closely resembling it which occur on Plum and Cherry. We shall provisionally call it the Maple-purse Mite-gall (*Acarus aceris crumena*).

Cheese-fly and Blow-fly—*B., Pickens Station, Miss.*—We have our reasons for adopting the plural form "funguses," in preference to "fungi," and we find that the custom is being adopted by some of the best writers in Europe. The skippers in cheese are distinct from those in bacon, the former being the larvæ of a small two-winged fly of a black color (*Peophila casei*, Linn.), and the latter the larvæ of a much larger blue species (*Musca vomitoria*, Linn.)

Fall Army-worm—*K. Kelsey, Ottawa, Kansas.*—The worms you send, which are called the "Army-worm," and which have appeared in such numbers as to alarm the farmers in your locality, are not the true Army-worm, but a very closely allied species. Indeed, they look so much alike, that most persons, not entomologists, would confound them together. The true Army-worm (*Leucania unipuncta*) never occurs so late in the season, but appears in your locality in May, and is never seen after the end of June; it also confines its attacks to cereals, and if you have access to our Second Missouri Report, you will there find a full account of it. The worm you send, on the contrary, mostly appears in the fall of the year, and though it is very fond of boring into the green ears of corn, yet it attacks all other grain, and even turnips and other garden truck. This worm was described in our First Report (p. 88) as the Wheat Cut-worm, from specimens received from Mr. T. R. Allen, in the fall of 1868; but when we consider its general habits, and the close resemblance which it bears to the true Army-worm, the name of "Fall Army-worm," by which it is generally known, becomes very appropriate. We did not succeed in breeding the worms two years ago, and the natural history of this species so far remains a closed book, which, however, we soon expect to unlock. This worm is at present (Sept. 10, '70) doing much damage in many parts of Missouri, and the same remedies and preventives employed against the Army-worm should be used here.

G. Pauls, Eureka, Mo.—Your worms are the same species referred to above.

Slugs on Plum trees—*Mrs. Frank Taylor, Canton, N. Y.*—The slugs that have been doing so much damage on your plum trees are, in all probability, the common Cherry-slug (*Selandria cerasi*, Peck.), and you will find the proper remedies suggested on page 296 of the last number.

Larva of Imperial Moth; Thoas Swallow-tail—*Geo. M. Dodge, Ohio, Ills.*—The large worm you describe, and which you found feeding on maple, is the larva of the Imperial Moth (*Dryocampa imperialis*, Drury). The immense black and yellow swallow-tail butterfly is *Papilio Thoas*, Linn.

Large Asilus Fly—*L. G. Saffer, Elizabeth, Ind.*—The two large Two-winged flies are ♂♀ of the Vertebrate Asilus (*Asilus vertebratus*, Say), which, however, belongs to the more modern genus *Promachus*. These flies are cannibals, and quite ravenous, two allied species (*Promachus Bastardii*, Loew., and *Asilus Missouriensis*, Riley) being great bee-killers, and consequently to be dreaded by every apiarian. The large pill-like galls which you find on the ground below white oak trees are apparently undescribed. We shall inform you further as soon as we breed the fly.

Mole Cricket—*V. K. Deyo, Makanda, Ills.*—The insect you send is the common northern Mole-cricket (*Gryllotalpa borealis*, Burm.) It is fossorial in its habits, living in underground galleries and feeding on the roots of plants.

The Imperial Dryocampa—*Samuel Willard, Springfield, Ills.*—The large yellow and blood-brown moth is ♂ *Dryocampa Imperialis*, Drury.

G. W. Copley Alton, Ills.—The large worm found on a gate-post is the larva of the above.

Hog-caterpillar of the Vine—*E. V. Noyes, Anna, Ils.*—This is your insect. (See pp. 22-4 of this vol.)

A rare capture in Illinois—*H. S. Bontell, Evanston, Ills.*—The large sulphur or citron-yellow butterfly, with a large quadrate orange patch near the middle of the front wings, and with the posterior part of the hind wings also more or less orange, is *Callydrias philea*, Linn., the largest species of the genus. Its habitat is usually given as Brazil, St. Domingo and Cuba, and the fact of your capturing it in northern Illinois is interesting, and its occurrence there very exceptional. Indeed, we do not think the species was ever taken in Illinois before. We have here another instance of that curious law which we have on several occasions referred to, namely, that many insects which on the Atlantic sea-board only occur in southerly latitudes, are often found in quite a high latitude in the valley of the Mississippi. We have now in our cabinet a specimen of that large and magnificent moth, *Thysania Zenobia*, Cram., which was last year taken by Prof. D. S. Sheldon, at Griswold College, Davenport, Iowa, though we know of no hitherto recorded instance of its occurrence anywhere near so far north.

Hag-moth Larva—*D. M. Hunter, Meadville, Pa.*—Your curious worm (Fig. 209) found on a young apple tree, and which we herewith illustrate, is the larva of the Hag-moth (*Limacodes* pithicium*, Sm. and Abb.) which was referred to on page 25 of this volume. When this worm is handled the long fleshy appendages not unfrequently become detached, and when spinning up it always detaches them of its own accord, and manages to fasten them to the outside of its round cocoon. The moth is of a dusky brown color, the front wings variegated with light yellowish-brown.

[Fig. 209.]

Color- Brown.

G. Pauls, Eureka, Mo.—You will recognize your worm in the above figure.

Insects named—*Mrs. E. U. B., Bar Mills, Me.*—The black, yellow and orange larvæ on Parsnip are those of the Asterias Swallow-tail (*Papilio asterias*), quite common, and repeatedly referred to in our answers. The pretty yellow and rose-colored moth is the Flowery Primrose Moth (*Alaria florida*, Guen.) Its larva feeds on the different species of Evening Primrose (*Œnothera*), and the moth itself may often be captured early in the morning in the calyxes of the flowers.

Some Friends and Foes—*Dr. C. W. Spaulding, Rose Hill, Mo.*—The banded bug found on rose bushes is the Many-banded Robber (*Harpactor cinctus*, Fig. 44 of Vol. I). The large ladybird is the 15-Spotted Mysia (*Mysia 15-punctata*); and the still larger black Ground-beetle, with coppery spots on the wing-covers, is the Fiery Ground-beeetle (*Calosoma calidum*, Fabr., Fig. 46 of Vol. I.) All these three are thorough cannibals, and beneficial. The two large long-horned beetles, bred from grape roots, are both males of the Tile-horned Prionus (*Prionus imbricornis*).

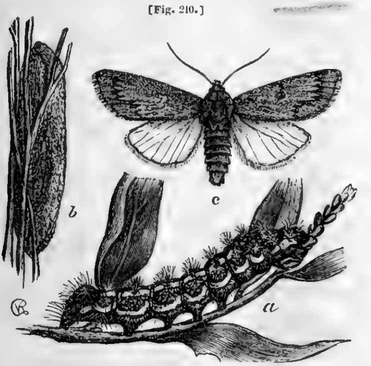
The Royal Horned Caterpillar—*Dr. J. T. Hodgen, St. Louis, Mo.*—Your immense larva on Persimmon is the above-named insect. It formed the subject of the plate to our first volume.

Dried up—*K. P.*—The larva in the rose-bud had become too dry to recognize.

*This insect belongs to the genus *Phobetron* of Grote & Robinson.

Caterpillars named—*Dr. E. H. King, West Liberty, Iowa.*—1. The green, black and yellow worms feeding on celery are the larvæ of the common Asterias Swallow-tail (*Papilio asterias,* Cram.) The forked process, or osmaterium, is simply a scent-organ, and has no stinging or otherwise injurious power. The smaller blacker worms are the young larvæ of the same species. This insect feeds on all sorts of plants of the Parsley Family (*Umbelliferæ*). 2. The black and yellow worms, with reddish warts on the back, and covered with stiff yellow and brown hairs, are a very common species of caterpillar, the larva of a speckled gray moth (*Acronycta ob-*

[Fig. 210.]



Colors—(*a*) Black, yellow and reddish; (*b*) pale yellow or brown; (*c*) gray.

linata, Guen.) which may be known in popular language as the Smeared Dagger, the moths belonging to this genus being very generally called Daggers in England, on account of a dagger-like mark which is common to most of them near the anal angle of the front wings. This insect is a very general feeder, occurring on a great variety of herbaceous plants, shrubs and trees, and it often proves injurious to Apple and Willow. We present herewith (Fig. 210) figures of the larva (*a*), the cocoon (*b*), and the moth (*c*).

Insects named—*L. P. Kraft, Belleville, Ills.*—No. 1, *Callimorpha vestalis*, Pack. (undoubtedly=*fulvicollis*). No. 2, *Acronycta populi*, Riley. No. 3, *Sesia diffinis*, Boisd. No. 4, *Acronycta psi*, Linn. No. 5, *Acronycta Americana*, Harr. No. 6, *Grapta progne*, Cram. No. 7, *Catocala innubens*, Guen. No. 8, *Homoptera lunata*, Drury. No. 9, *Calopteryx maculata* ? No. 12, *Perithemis domitia*. No. 14, *Diplax rubicundula*, Say=*assimulata*, Uhler. No. 15, *Libellula luctuosa*, Burm. No. 16, *Agrion apicalis* ♂, Say.

The Botanical Department—*Thos. W. Duffy, Jefferson, Texas.*—The botanical department, as we have before stated, is under entire charge of the botanical editor. We have nothing to do with it, and are not responsible for anything that appears in it. On the question of the Origin of Species, we have for many years admired Darwin's development hypothesis, and the longer we live the firmer we believe in it.

Colorado Potato Beetle—*C. C. Collins, Chicago, Ills.*—Your beetle is no more nor less than this dreaded insect.

Dr. S. Holman, Springfield, Mo.—The "grubs" you send are its larvæ.

The Abbot Sphinx; Parasites on its Larva—*Thos. W. Gordon, M.D., Georgetown, O.*—The caterpillar sent is the larva of the Abbot Sphinx, a pretty chocolate-brown hawk moth, having a yellow patch on each hind wing, and which we recently illustrated. These and other larvæ of the Sphinx tribe are frequently attacked by a very small four-winged fly belonging to the genus *Microgaster*, in the Order *Hymenoptera*. The fly does not eat the flesh of the caterpillar, but punctures its skin, and inserts in its body minute eggs at various points; these eggs hatch therein, disclosing small white grubs or maggots, which subsist on the fat and flesh of the caterpillar until the latter is full grown. The parasites then make their exit through the skin and spin their cocoons, loosely attaching them to the surface of the caterpillar, which generally dies from exhaustion soon after, while the parasites themselves pass through their transformations in a few days and become four-winged flies like their parent.

Crane-flies—Rose-bugs—Ants—*Dr. J. W. Potts, Elizabeth, Ind.*—The long-legged insect sent, is an undetermined species of Crane-fly (*Tipula*). They feed in the larva state on the roots of grass and other plants. No. 2 is, as you suggest, the common Rose-chafer (*Macrodactylus subspinosus*), which is almost omnivorous, very few plants being unpalatable to its taste. All male and female ants when first developed from the pupa have wings, the barren ones or workers never. The males and females after pairing, which they effect on the wing, drop to the earth and cast off their wings. The males soon die, and the females retire to their chambers to lay eggs; but neither ever again acquire wings. The females are the largest; the workers, or nurse-ants, generally next in size, and both kinds may, of course, be found in the same nest.

Not a Gall but a Wasp Nest—*Kate Parsons.*—The round cell which you found at the root of a nasturtium is not a gall, but the mud cell of the Fraternal Potter Wasp (*Eumenes fraterna*, Say) which we illustrated at Figure 110 of the first volume.

Cabbage Worms—*B. H. Foster, Babylon, N. Y.*—The green cabbage worms which are causing such destruction to the cabbages in your part of the country, are the larvæ of the imported Rape Butterfly (*Pieris rapæ*), which we have several times referred to. Salt is found more effectual than either tobacco, cresylic acid soap, or guano.

The Unicorn Prominent—*Emma Payne, Racine, Wis.*—The reddish-brown worm, with the second and third joints green, and a prominent horn just behind them, which worm you found on a rose bush, is the Unicorn Prominent (*Notodonta unicornis*, Sm. & Abb.) The moth has the front wings light brown, variegated with greenish-white and dark brown: the hind wings in the ♂ are whitish with a dusky spot on the inner hind angle, while in the ♀ they are dusky. The worm feeds on a variety of trees and shrubs, and though when perched on the edge of a dark green oak leaf there seems little resemblance between the animal and its food, yet we quote your interesting remarks about its mimicry:

"I think this worm furnishes a wonderful instance of mimicry of the vegetable by the animal organism. The green segments just back of the head resemble a small portion of the green leaf, and the other parts admirably counterfeit the brown-and-russet tints of the dead leaf, while the form of the animal in its various postures aids the deception by its resemblance to a leaf partly alive and partly dead, the green mostly eaten and the brown torn."

Botanical Department.

DR. GEORGE VASEY, EDITOR, Richview, Ills.

MARITIME PLANTS OF THE GREAT LAKES AND THE INTERIOR.

The occurrence on the shores of the Great Lakes and in the interior of the Continent of a considerable number of plants which are usually confined to the vicinity of the sea-shore, has given rise to some speculation as to the cause of the phenomenon. The plants of this character are not confined to any particular family, although the Grasses and Sedges are probably most frequently represented. On the beach in the vicinity of Chicago the Sand-reed (*Calamagrostis arenaria*) sends its long fibrous matted roots deeply into the sand, binding together the shifting soil, giving stability and permanence to the lacustrine boundaries. The Bur-grass (*Cenchrus tribuloides*) presents here and there prickly clumps which are the horror of bare-footed juveniles; and the Baltic Rush (*Juncus Balticus*) by means of its creeping tangled rhizomas, striking root at every joint, is an efficient co-worker with the Sand-reed in giving firmness to the sandy shore.

This work is also performed by various species of *Cyperus*, *Scirpus*, and *Carex*, which, however are more extended and cosmopolitan in their range. In the low ground back from the lake the Squirrel-tail grass, (*Hordeum jubatum*) waves in graceful billows before the breeze. The Arrow-grass (*Triglochin Maritimum*) is common in the wet marshes near the lake; and in pools connected with the lake are many Pondweeds, among them a species (*Potomageton pectinatus*), which also abounds in similar situations along the seacoast.

The sea-side Spurge (*Euphorbia polygonifolia*) luxuriates in the clean, loose sand of the ridges near the lake shore.

Atriplex hastata a plant of the pig-weed family (*Chenopodiaceæ*) common on the seashore has also recently been found in the vicinity of the lake. Another remarkable plant of this family (*Corispermum hyssopifolium*) is an immigrant to the lake borders from the far Northwest, and has followed the line of the lakes down as far as Buffalo on Lake Erie.

There are perhaps no *Compositæ* in the neighborhood of the Great Lakes which are at all peculiar to the seashore. The *Artemesia caudata* which occurs on the New England coast appears also on the lake shore, but is not confined to it, being found also far in the interior.

The Prickly pear, (*Opuntia vulgaris*) once very abundant in sandy fields north of Chicago still occurs in limited quantities, and when in bloom presents a very showy appearance from the large yellow flowers with which the prickly masses are covered.

The Beach pea (*Lathyrus maritimus*) also makes its appearance on the shores of the Great lakes, seemingly quite as much at home as in the vicinity of salt water.

Of Cruciferous plants from the seashore we have the Sea-Rocket, (*Cakile Americana*) growing in the pure sand "almost to the water's edge."

The sea-side Crowfoot (*Ranunculus cymbalaria*), (the subject of an article in a previous number), is abundant in the neighborhood of Chicago, and in the vicinity of the Salina (N.Y.) salt-springs, but not elsewhere East until we reach the Atlantic coast.

The attention of our Chicago botanists has been directed to this subject, and some theories have been advanced as to the origin or introduction of these peculiar plants.

In a paper read before the Chicago Botanical Society, by Mr. H. A. Warne, after a review of most of the plants which we have mentioned he proceeds to say:

"It is an interesting question why it is these maratime plants are found so far inland, and yet confined to the borders of the great fresh water lakes. How came they here? Have they by some means been brought from the Eastern coast and become accustomed to new conditions of life, passing through a process of weaning from a saline soil and atmosphere? Or have these species, wherever found, no special relish for maritime conditions of life, including the presence of salt? Two of the plants enumerated, it appears from Gray's Manual, are also found inland around the salt springs at Salina, N. Y., thus seeming to be naturally attached to a saline region. It is, therefore, the more remarkable to find them here by the side of fresh water, and restricted to the region of the Great Lakes.

The other species mentioned are all true maratime plants, but do not so plainly indicate the relish for salt. Yet still the question returns, how shall we explain the presence of these seaside plants here? How shall we solve this relation of the Great Lakes to the sea? The problem may seem utterly insoluble; but if we accept the theories of those distinguished naturalists, who pronounce each vegetable organism the lineal descendant of the plants of the past, even to the remotest epochs of geological history, however changed they may be from original types, and adapted to modified conditions of life, we may readily find a solution of their presence here, in the existence of a vast ocean, of which the chain of Great Lakes are but the pools remaining after a redistribution of the waters, freshened, it may be, by means not beyond the limits of scientific explanation. Granted this, and we see in these strangely placed plants the lineal descendants of maritime races, inhabiting the coast of a sea once stretching from the lakes to the Atlantic, and adapted, by degrees, to the conditions of a life beside fresh waters.

An interesting natural feature supporting our hypothesis of an extensive ocean, embracing the Great Lakes, is found near the city, in the terrace elevated some twenty-five feet above the present level of Lake Michigan, and extending, I am told, for many miles, forming, evidently, the ancient lake boundary. This is peculiarly apparent in the neighborhood of Calumet lake, which, without doubt, once formed part of Lake Michigan. The terrace here is about a mile distant from Calumet lake, and standing upon it and looking down upon the flat lands below, as the eye follows the curve of the high land, the basin-like form strikes the eye with conviction, and one instinctively grasps the conclusion that here, in the remote past, was the shore of Lake Michigan, which, in its retrogression, left this noble terrace and Calumet lake as mementoes of the day of its wider sweep and oceanic proportions.

Viewing this terrace botanically also, we find new confirmation of our theory. One is struck immediately by its older aspect compared with the low grounds between it and the lake. While these have the marked indications of comparative newness and of submersion beneath the waters, the terrace lands, in soil and vegetable growth, suggest the idea of immemorial highlands; and a close examination of the plants supports the first impression. The change in the flora of the neighborhood, within the space of a few rods, as one walks up the terrace from the low grounds to the wood lands above, is actually startling. Beside the noble tree growth we find a multitude of plants suggesting the Eastern States. *Comptonia asplenifolia*, the blue-berry, the ferns *Osmunda regalis* and *Claytonia*, *Honstonia purpurea*, the orchids, *Habenaria tridentata* and *lacera*, with that curious plant, rare anywhere except the sea coast, *Xyris flexuosa*, and everywhere one treads on the soft mosses of Eastern woods."

Let us repeat these inquiries: Are these plants the remains of an ancient maratime vegetation? or have they been brought here by the general agencies of plant distribution, and found conditions of soil, humidity of atmosphere (modified by the existing large bodies of water), etc., favorable for their growth, the presence of *salt* water not being one of those conditions?

Let us add another: May these species be of a cosmopolitan character spreading over vast areas, and accommodating themselves to a great variety of circumstances?

In determining these questions it is necessary to take a somewhat enlarged view of the geographical range of the species which have been referred to, and of such others as may throw light on the subject.

Thus, the Baltic Rush (*Juncus Balticus*) follows the course of the Lakes from the St. Lawrence to Chicago, reappears on the Western rivers, extends into the Rocky Mountains, and thence to the Pacific coast from California to Alaska.

The Arrow-grass (*Triglochin maritimum*) has quite as extended a range, occurring in the prairie marshes or bogs, reappearing in the Rocky Mountains on muddy banks of the Grand and Green rivers, and again on the Pacific.

Almost the same may be said of the Squirrel tail grass (*Hordeum jubatum*), although its selection of soil is different.

The seaside Crowfoot (*Ranunculus cymbalarius*) appears again on the sandy borders of the Platte in Colorado, and also on the west side of the Mountains. *Artemesia caudata* and *Atriplex hastata* may be named in the same connection.

We have not observed *Rumex maritimus* in the immediate vicinity of the Great Lakes, but it is found on marshy prairies thirty or forty miles back from the Lake, also in Missouri, and again on the borders of ponds and rivers west of the Rocky mountains. The Willow dock (*Rumex salicifolius*) of the coast of Massachusetts and Maine, also grows on western river banks, as at Omaha, and west of the mountains in Middle Park, and again on the Pacific. One of the peculiar plants of the lake-border which we have mentioned (*Corispermum hyssopifolium*) does not occur on the Atlantic, but is found on our North-western coast in Alaska, and on sandy river banks in the interior basins.

Indeed, on the Great Plains, and in the basins wests of the mountains, there are still other plants which are usually regarded as maritime, for instance, *Glaux maritima*, *Chenopodina maritima*, and *Sesuvium Portulacastrum;* also the grasses *Brizopyrum spicatum*, and *Tricuspis purpurea*.

It would seem that with respect to all the plants we have had under consideration, the presence or vicinity of *salt* water is not a necessity; but for some the moist sandy soil, and for others, also the modifying influence of large bodies of water, are the conditions suitable for their propagation.

Probably there are some terrestrial plants to which salt is an essential element, and which cannot be made to flourish except in the neighborhood of that element. Such plants as the Sea Kale (*Salsola kali*), the Seaside Plantain (*Plantago maritima*), Marsh Rosemary (*Statice limonium*), the Sea-lungwort (*Mertensia maritima*), the Samphire (*Salicornia*), and others of similar habit, have not been found except in the immediate vicinity of salt water.

We are, however, fully disposed to admit that there is much plausibility in the supposition that these peculiar lake shore plants are vestiges of the vegetation which once flourished upon the borders of the great inland seas which at a comparatively recent time spread over the interior of this continent.

We do not consider the question settled, but present these researches as a contribution toward a more comprehensive view of the question.

OUR NATIVE OAKS—No. 4.

(Fig. 211.)

Black Oak (*Quercus coccinea*, variety *tinctoria*.)

There is greater confusion as to the common names of different species of Oaks than with respect to any other trees. Thus some half-dozen trees are variously known as Black Oak, Red Oak, Pin Oak, &c. This confusion arises from the close resemblance of several species to each other, the large variation as to form and size of leaves and acorns in the same species, to the tendency to hybridize among several species, and to the want of close and discriminating observation.

The various forms to be met with every day are frequently very puzzling, even to botanists. We shall in this article attempt to describe and illustrate one of the commonest and most variable of our American oaks. The extreme forms of this oak have been classified by botanists as two distinct species, viz: *Quercus tinctoria*, Bartram, and *Quercus coccinea*, Wang.; but the best botanical authorities now unite these as varieties of one species. Indeed, so numerous are the variations presented in this species, both in leaf and fruit, that we might with as much propriety establish half a dozen species as two. From a great number of specimens we have selected a few of the more prominent to give their characters.

[Fig. 212.]

Black Oak (*Quercus coccinea*, var. *vulgaris*.)

A general description of the species may be stated as follows: Leaves oval or oblong, or sometimes, on young thrifty shoots, obovate in outline, with about three divergent, slightly or deeply cut, lobes, the lobes also sparingly and sharply toothed; downy when young, and in some varieties the under surface continuing downy when old, upper surface glossy, the finer lobed ones with long petioles or stems, thick and firm when mature; acorns roundish or ovate, ½ to ¾ inch long, cup obconic and deep, or shallow and nearly saucer-shaped. A good sized tree, 50 or 60 feet high, the bark smooth and mottled on young trees, rough and blackish on old trunks; the inner bark of an orange color, and valuable in tanning and dyeing. The wood is extensively employed for timber and fuel, but is inferior to the White Oak.

Quercus coccinea, variety *vulgaris* (Fig. 212) is probably the commonest form of the species, especially in the Western States. The leaves are cut more than half-way to the midrib, bright green and shining both sides, and with long slender petioles. The fruit is somewhat larger than in the preceding, but in the figure is represented rather disproportionately large.

[Fig. 213.]

Black Oak (*Quercus coccinea*, var. *microcarpa.*)

This is a very common form, especially in Northern Illinois. The leaves are unusually large and finely lobed, the acorns small and pointed, and the cup very shallow.

Quercus coccinea, var. *tinctoria* (Fig. 211). This is the form which has usually been called *Quercus tinctoria*, Bart. The figure is from a Pennsylvania specimen, and is reduced in size about one half. The leaves are less deeply lobed than any of the others, with shorter petioles, and generally with some rusty down along the veins on the under side. The acorns are about half an inch long. This variety is not, according to our observation, common in the Western States.

The other principal forms we have not space to illustrate; they are—

4th. The variety *depressa*, with leaves like those of the variety *microcarpa*, but with much larger and shorter acorns, the scales of the cup loose at the border. It approaches *Quercus palustris*, DuRoi.

5th. Variety *coronata*, with obconic cup, the border forming a crown of loose scales.

6th. Variety *intermedia*, intermediate between the varieties *depressa* and *microcarpa*.

NOTES ON PLANTS COLLECTED NEAR CHICAGO.

BY H. A. WARNE, CHICAGO, ILLS.

II.

The summer months afford a rich harvest of interesting species to the collector in Northern Illinois; for the region near the south shore of Lake Michigan seems to combine, in a remarkable degree, the distinctive plants of the prairie with many that appear to belong more properly to the States further north and east.

As the season progresses beyond the chances of frost, the richer-hued plants hasten into bloom in troops, until June and July are gay with flowers. Conspicuous among these is the brilliant Scarlet Painted Cup, which Bryant has celebrated in exquisite verse, and a bright yellow variety of the same species (*Castelleia coccinea*).

Space will allow me to give only a partial list of our summer plants. The Perennial Lupin (*Lupinus perennis*) finds a favorite habitat here, and sometimes makes the space of an acre beautiful with its sky-blue flowers. The Golden Alkanet (*Lithospermum canescens*) delights in the same locality, and a little later the showier *Lithospermums* come into bloom, both *L. hirtum* and *L. longiflorum*, but the latter not common. The Primrose family is represented by the Shooting Star (*Dodecatheon Meadia*). Its pretty pink-purple flowers, with coquettishly reflexed petals, are quite unique in aspect, and suggest the favorite *Cyclamen* of the greenhouses. It varies to pure white.

An old Swedish botanist who had visited Chicago, and was taken to one of our best wild garden spots in June, exhibited all the enthusiasm of a child at the pleasant sight, and could scarcely leave a lupin unplucked. Later in the season this locality is bright with the flame-colored cups of the beautiful Orange-red Lily (*Lilium Philadelphicum*), worthy of place in any garden.

The genus *Ranunclus* is well represented here by seven species, the white Water Crowfoot (*R. aquatilis*, var. *trichophyllus*), *R. abortivus*, the the small-flowered species, the Hooked Crowfoot (*R. recurvatus*), the Yellow Water Crowfoot (*R. multifidus*) a lover of the water and the most interesting species, the Early Crowfoot (*R. fascicularis*), the Creeping Crowfoot (*R. repens*), and lastly the delicate Sea-side Crowfoot (*R. cymbalaria*), a curious little thing, with small flowers and fleshy, roundish heart-shaped leaves, sending out long rooty runners.

Our handsome Columbine (*Aquilegia Canadensis*) is not rare here. The Pitcher Plant (*Saracenia purpurea*), one of the most remarkable of our native plants, used to be in several localities, as different herbariums attest, but no one has of late been able to find a specimen.

A species of Cactus (*Opuntia Raffinesquii* [?]) grows quite abundantly on the sandy ridges north of the city along the lake shore, and makes quite a display with its large yellow chalices. It is a *noli-me-tangere* sort of thing, however, and resents handling. In company with it I find the peculiar thistle of the Great Lakes (*Cirsium Pitcheri*), with cream-colored flowers, blooming half a month earlier than its congeners. It has an ashen, woolly aspect, and is of low growth.

Rhus toxicodendron, the Poison Sumach, is abundant in a dwarf form, and is almost as much dreaded by some of our botanists as a venomous reptile might be. A touch, or even slight exposure to its subtle exhalations, it would seem have been enough to confine certain of my acquaintances to their rooms for a fortnight. *Celastrus scandens*, the Climbing Bittersweet, or Wax-work, is also common along the lake shore. It is insignificant in flower, but very showy when its orange and scarlet fruit opens in autumn. The Hop Tree (*Ptelea trifoliata*), a tall shrub, seems to thrive in almost pure sand with the foregoing plants. Its bitter, winged fruit is sometimes used as hops, it is said.

In moister places, in the same district, I find the Evening Primroses, the weedy *Œnothera biennis* and its handsome relation, *Œnothera fruticosa*, known as Sun Drops; with two of the Saxifrage family, both quaint plants—*Heuchera hispida* and *Saxifraga Pennsylvanica*. Along the ditches is the Mermaid Weed (*Proserpinaca palustris*), quite commonly associated with two of the False Loosestrifes (*Ludwigia polycarpa* and *L. palustris*), homely plants that somehow attract the attention of the botanist as much as more showy things. *Triglochin maritimum*, the Arrow Grass, is also abundant and curious, in company with the Water Plantain (*Alisma plantago*). Kalm's St. John's Wort (*Hypericum Kalmianum*) abounds immediately in the vicinity of the lake, its large yellow flowers, in the greatest profusion, gleam like gold. Why has it not found its place in the garden?

I find three of our native roses here—*Rosa lucida*, *Rosa blanda*, and the Swamp Rose (*Rosa Carolina*), sometimes exceedingly handsome. Two species of Spiræa are found, both pretty—*S. salicifolia*, the common Meadow Sweet, and the Nine Bark (*Spiræa opalifolia*), a tall shrub white with blossoms. In the same locality with the latter, north of the city, two species of Viburnum are abundant—*V. lentago*, the Sheep Berry, handsome both in flower and leaf, and the Cranberry Tree (*Viburnum opulus*). The Snowball of the gardens, so familiar to all, is a cultivated form of this plant. By some the original is preferred for ornament, and with considerable reason, as its broad cymes are handsome, and the bright red fruit abundant. It is a poor substitute for the Cranberry, in flavor as well as on account of its large flat stone. Two other interesting plants of the Honeysuckle family were found in company with the Viburnums, *i. e.*, *Lonicera parviflora* and *Diervilla trifida*, the latter sometimes cultivated, though scarcely showy enough for ornament. The Horse Gentian (*Triosteum perfoliatum*), an oddity of the same family, is found later; with the common Elder (*Sambucus Canadensis*).

The Water Lily family is represented by the Yellow Spatter-dock (*Nuphar advena*), and *Nymphæa tuberosa*. If the Sweet-scented Water Lily (*Nymphæa odorata*) is found here it is not common, One specimen only was referred to that species, mainly because of its delightful fragrance, rather than from any marked difference from its scentless neighbors.

The noble Yellow *Nelumbo*, or Water Chinquepin, is found at Calumet Lake, about fourteen miles from Chicago, but an excursion made expressly to collect it resulted in the finding of its remarkably large leaves only, the flowers being missing. In the southern part of the State it is no rarity.

Among the water plants of interest, also, I must include the beautiful Buck-Bean (*Menyanthes trifoliata*), *Pontederia cordata*, the Violet-flowered Pickerel Weed, and the Water Shield (*Brasenia peltata*). This last named plant, the Manual of Gray tells us, is of singularly wide distribution, being also a native of Puget's Sound, Japan, Australia and Eastern India.

Petalostemon candidus and *P. violaceus*, distinctive prairie plants, and called Prairie Clover, are both common here. Among a number of leguminous plants I may also enumerate *Astragalus Canadensis*, a vigorous, tall plant with cream-colored flowers, the Ground Nut (*Apios tuberosa*) a handsome vine of strong growth, with violet-scented flowers of chocolate color, *Lathyrus palustris* and *L. maritimus*, the Beach Pea, as much at home here as on the sea shore, associated also with *Phaseolus diversæfolius* here as along the Atlantic—both confined to the immediate neighborhood of the Lake, and delighting in pure sand. The so-called Lead Plant (*Amorpha canescens*), named from a miner's whim, is partial to the sandy Lake region also. Its violet flowers are quite singular, consisting of one single petal wrapped about the stamens, and quite often puzzle the young botanist, who sees little of the pea family in the aspect of such a flower, the standard being only left, the other petals absent. But quite as much of a *pons asinarum* to the youthful plant-analyzer is the Rattlesnake Master (*Eryngium yuccæfolium*), quite common here, which few would take at sight to be related to the members of the Parsley and Carrot family.

Peculiar to the Lake shore, also, and almost within reach of the spray, is the Sea Rocket (*Cakile Americana*), with flowers and pods much like those of its cousin the Radish, but otherwise of very different aspect. It is generally found with *Euphorbia polygonifolia*, a distinctive plant of the Great Lakes, and *Corispermum hyssopifolium*, a plant adventive from the Northwest, but thoroughly established here. Its general appearance somewhat suggests *Salsola* of the Atlantic coast. *Potentilla anserina*, the Silver Weed, also claims its place along the Lake shore with these last named plants, though higher up on the beach, where it throws out long runners, bright with golden flowers and silver-lined leaves. Its taller relative, *Potentilla fruticosa*, grows with it in places, a plant worthy of cultivation for its beauty. *Potentilla palustris*, the Marsh Five-finger, is found in wet places here and there also.

A list of the shore plants is very incomplete without a brief mention of the more striking grasses that attract the eye: these are *Calamagrostis arenaria*, the Sea-sand Reed, *C. longifolia*, *Sorghum nutans*, *Sporobolus heterolepis*, *Stipa spartea*, the Porcupine Grass, *Andropogon furcatus* and *A. scoparius*, *Elymus Canadensis*, "Wild Rye," *Spartina cynosuroides*, Fresh Water Cord Grass, and *Hordeum jubatum*, the Squirrel-tail Grass, sometimes cultivated for ornament elsewhere.

An hour's ride in the cars takes us into the county of Lake, in our neighboring State of Indiana. Here the aspect of the flora seems entirely changed. Coming to Pine Station, only twenty miles distant from Chicago, we find ourselves in the midst of evergreen woods, with scarcely a deciduous tree to be seen. Here were the White Pine (*Pinus strobus*), and *Pinus Banksiana*, the Gray Scrub Pine, with the common Juniper (*Juniperus communis* var. *alpinus*), frosty with the white bloom of its abundant fruit. The herbaceous plants associated with this evergreen growth are in strong contrast with the prairie vegetation immediately about Chicago.

The narrowness of this belt of pine woods is singular. Passing on to the shore of Lake Michigan we find the evergreens disappearing, while the oaks and poplars reappear. Soon only an occasional pine tree can be seen, until at Miller's Station, nine miles further at the Lake shore, I do not remember to have seen an evergreen. But the herbaceous flora here strongly suggests Michigan and the Eastern States. We find the Huckleberry in profusion, and in wet places the large Cranberry (*Vaccinum macrocarpon*); my list includes also the Dwarf Sumach (*Rhus copallina*), the Black Alder (*Ilex verticilla*), the Sour Gum Tree (*Nyssa multiflora*), the Leather-leaf (*Cassandra calyculata*), the pleasant flavored Wintergreen (*Gaultheria procumbens*), *Pyrola rotundifolia* and *Pyrola secunda*. Two species of the interesting Sun Dew family—*Drosera rotundifolia* and *longifolia*—abounded, *Melampyrum Americanum*, oddly termed Cow Wheat, and the Sassafras tree. The delicate little blue *Houstonia cerulea* filled the spaces among the grass, with occasional plants of our yellow flowering flax, *Linum Virginianum*. In the wet grounds we found *Utricularia cornuta* and *Utriaclaria vulgaris*, the horned and the greater Bladder-wort. *Pogonia ophioglossoides* in profuse numbers scented the air with its rich fragrance, vieing with its beautiful but scentless relative *Calopogon pulchella*, of which I never met equally fine specimens; the flower-stalks were exceedingly vigorous, with ten or twelve blossoms on some, the whole plant exceeding 18 inches in height. One specimen of *Liparis Loesellii* was found. A fortnight later the handsome Orchid, *Habenaria ciliaris*, with bright orange flowers, was abundant. *Talinum teretifolium* was also met with, and, at a locality not far distant, *Hudsonia tomentosa* and *Campanula rotundifolia* var. *linifolia*. The beautiful Moccasin Flower, *Cypripedium spectabile,* should have been mentioned also.

But space must forbid further enumeration, though the list of interesting plants might be much extended. As the autumn comes on, too, the Composite plants come out in full force here, including many species of *Helianthus, Aster* and Golden Rod (*Solidago*), while the rich blue of the Fringed Gentian (*Gentiana crinita*), and the curious closed Gentian (*Gentiana Andrewsii*) is a sight never to be forgotten, such a perfection of color as can only be rivalled by the intense crimson of our Cardinal Flower (*Lobelia cardinalis*), found here along the small river Des Plaines.

MORPHOLOGY OF LEMNA.

BY HENRY GILLMAN.

Some interesting remarks appeared lately in the *Quarterly Journal of Science* on the "Hibernation of Duckweed" (*Lemna*). Allusion is made to a series of observations on this point made by M. Van Hoven, and recorded in the "Bulletin de la Sociétié Royale de Botanique de Belgique;" but which I have not seen. As about two years ago I made some observations on this subject, my experience may be worth noting in this connection. It has not been given publicity, though not long afterwards I communicated the facts, in part, to a correspondent who has devoted much time to the study of the American *Lemnaceæ.* It may here be stated that our species of Lemna appear to be identical with those of Belgium.

In the summer of 1868 I placed in my aquarium a quantity of the plants of *Lemna polyrrhiza,* L., partly with the hope of detecting them blossom. They grew and multiplied till the early winter, when the fronds gradually decayed and disappeared. Towards spring I noticed at the bottom of the aquarium, adhering to the mud and stones, a number of minute, gem-like bodies, smaller than the head of the smallest pin, and of an intense green. These increased in size, and at length assumed somewhat of the appearance of the frond of a small Lemna, finally rising to the surface of the water, where they continued to grow. In the course of a few weeks a large number of these Lemna could be seen in my aquarium, they having increased by proliferous growth. At this time they presented so closely the characteristics of *L. Torreyi,* Austin, as to deceive me quite into thinking them that species; the thin obovate-oblong fronds were of a pale green, but glossy, and barely one-nerved, the root being single. But in the course of several days another change took place. The fronds became broader and rounder, lost their glossiness, and put on a dull but darker green above, having a faint pink flush beneath. At length, after a further interval, the fronds becoming thick and palmately five to seven-nerved, and changed to a purplish-crimson beneath, the roots being several in a cluster, proclaimed unmistakably that the plant was *L. polyrrhiza,* L., and nothing else.

From the foregoing I am convinced that much of the Lemna which is taken for *L. Torreyi,* Austin, and *L. perpusilla,* Torr., and, perhaps, *L. minor,* L., is no other than *L. polyrrhiza,* L., in some of its earlier stages. And here arises the question: Is it a more highly developed plant (species) than those others? Or is it degraded from the condition of *L. Torreyi?* I would add that it is somewhat remarkable that this plant (*L. polyrrhiza*), though so common in our pools, ponds and rivers, has never been found in blossom in this country.

According to M. Van Hoven, as given in the *Journal,* the three species, *L. trisulca, minor* and *arrhiza,* preserve their leaves through the winter, remaining on the surface, while only the *L. polyrrhiza* and *gibba* produce leaves of a different form in winter. He also states that "their roots are exceedingly minute, and at first hidden within the leaf."

Some weeks ago, when at Eaton Rapids, Mich., a place lately become celebrated through the discovery of those remarkable magnetic mineral springs, I found (June 7, 1870) the *L. minor,* L., in blossom—thousands of them in flower. As it is a species which is rarely seen in bloom, the information may be interesting to your readers.

Late last autumn (1869) a friend, a well-known botanist from the East, found in the Detroit river a single specimen in flower of the *L. trisulca,* L. It was a gusty day, and as he searched in his pocket for a piece of paper in which to secure it, the wind suddenly blew it away, so that he could not recover it. But he is too accurate an observer for us to imagine that he was mistaken as to its bearing flowers. It is, also, rarely found fertile.

Though the Lemna generally floats free, its roots suspended in the water, and drifted about by every stray breeze or current in the stream or pond, yet I find, where the water is shallow enough, it sends its roots into the soft mud at the bottom, thus becoming a fixture.

I find the *Wolffia Columbiana,* Karsten, growing with *L. minor,* L., in abundance in the neighborhood of Detroit; but have not collected it in flower.

P. S.—August 29, 1870.—I have to-day found, at Sandwich, Ontario, on the Detroit river, the *Wolffia Columbiana*, Kars., in full flower. I inclose specimens, but hardly hope they will arrive in perfection. The surface of the pool where I found them, and where I have watched them for more than a year, is covered with the little plants for more than three-quarters of an inch thick. H. G.

[For the benefit of some who may be unacquainted with the plants mentioned in the communication of Mr. Gillman, we may state that the species of *Lemna* are extremely minute plants growing on the surface of ponds and still waters, and sometimes called Duckweed. They vary in size from one-twelfth to one-quarter of an inch, consisting of a simple leaf-like body with slender roots emitted from the under surface. They rarely produce flowers in this country, the usual mode of reproduction being by the development of small, bulb-like bodies from the edge of the leaves; these bulbs sink to the bottom of the water in the fall, and rise to the surface for development in the spring. The flowers, when they do appear, are produced from a slit or opening in the edge of the leaf; they are reduced to the simplest state, one or two producing a single stamen, and one or two a single pistil.

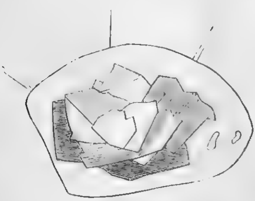
The Wolffia is a plant of similar nature, of microscopic size and simpler structure, each plant producing a single flower of stamen and pistil, formed by a small cup-like depression in the body of the leaf or plant.—Ed.]

VEGETABLE CELLS.

BY DR. FELIX SCHAAN, CHICAGO.

PART III.—*Continued from page* 256.)

[Fig. 214.]



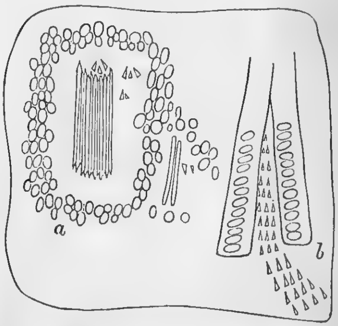
Oxalate of Lime in Cactus.

3. Crystals. In the vegetable cells we often find crystals of oxalate of lime; they crystalize in form of quadratic octahedrons. It is seldom we find this octahedron well developed; you see a large heap of plates agglomerated irregularly one to the other. In Cactus you find them in every slice. Geranium presents also a large amount of cells containing crystals. (See Fig. 137.)

Schleiden says that oxalate of lime crystals can take also the form of needles. I had some doubt whether all needle-shaped crystals were oxalate of lime, and, on inquiring, I went to the following statements. The crystals of oxalate of lime in the Cactus, I treated with nitric acid. It was not dissolved entirely, but corroded only on the edges. I added a drop of ammonia, and I saw that the crystal disappeared rapidly, leaving several gas bubbles.

I made a precipitate of oxalate of lime by double decomposition, by pouring into a solution of nitrate of lime, a solution of oxalate of potash, and carefully washing the precipitate, selected on a filtering paper: trying on this oxalate of lime the reactives above mentioned, I found them verified. So it may be stated that these crystals are oxalate of lime. Some needle-shaped crystals I submitted to a careful study with the following result: I took for object the rasping of the root of Sarsaparilla (*Smilax Sarsaparilla*). By the addition of a drop of water we find in the middle of a ring of starch globules a fascicle of needle crystals, and near by you find other needles whose points are broken and scattered in the vicinity. (Fig. 215, *a*).

[Fig. 215.]

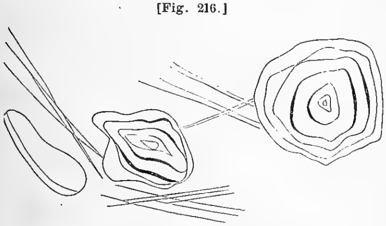


In a longitudinal slice of the same root, you may remark between the porous cells and the starch cells a long line of these needle-shaped crystals, whose points all look in one direction and follow one another like a procession of ants going to the hillock. (Fig. 215, *b*). At first I thought—there we have cells with crystals like the Cactus and Geranium cells, and I suspected some porous cells to be the home of these crystals. Error! I analyzed the rasping of the root *without* water; I could not find any needles or a trace of a crystal. In the heap of starch I remarked a transparent rippled object which I thought was the source of the crystals. I then poured a drop of water between the object glasses, but the same object was not changed; in moving the object I found near by the well constituted needles, where there was nothing of that kind before.

I repeated several times the same experiment, and saw finally the needles take their origin of the surrounding shapeless matter in a twinkling. What are they composed of? Oxalate of lime? This latter salt is obtained by nitric acid, but the needles I saw appear more numerous by the addition of nitric acid. Ammonia dissolved them. I took these needles for *salseparine.* This base is not soluble in water, and crystalizes in needle-form. So when you force water between the glass plates where salseparine is contained, this base is precipitated in the form of needle crystals, following the law of chemistry that every body contained in excess in a menstrum is precipitated in the form of crystals or of amorphous granules.

In the incrustations of the liber cells of Cinchona (Fig. 216) we encounter also salts, but these are in an amorphous state. Without doubt quinine is to be found there. By the addition of a drop of sulphuric acid the quinine combines with it and forms sulphate of quinine, which being less soluble in water precipitates in very fine needles. At the same time we see that between the layers at the inside of the cellulose membrane (Fig. 216) there appears a series of

[Fig. 216.]



holes which grow larger and more numerous, leaving, of the entire cell and its layer, only a mere shadow.

4. Chlorophyl grains are little roundish bodies of a greenish color. They are disseminated in most fresh vegetable cells, and abound particularly in those which are nearer the outer surface of the plant. By oxydation the green color turns yellow and red. The chlorophyl is the matter which gives to foliage its beautiful hues: in spring, green in all its variations; in the fall, yellow, and all transition stages to scarlet.

5. Granular substances are found in many cells. Sometimes these granules are composed of starchy matters, as detected by their coloring blue with iodine: at other times it is very difficult to study their composition. I remarked in some cases an active movement of these granules, by their changing their places in respect to one another and to larger bodies in the interior of the cells.

6. Gases. Under the covering plate in our microscopical researches gases present themselves, all alike, as bubbles of sharp contour. Chemistry only can tell us what gas is the generator of the bubble in question. In the plants, as it is known, we meet with carbonic acid, oxygen, and atmospheric air.

For a carbonic acid bubble, we have a test in a solution of chloro-barium (Ba. Cl.) in which carbonic acid makes a precipitate of carbonate of barium, which has the form of fine granules. Oxygen, we know, is the gas "par excellence" which is present in vegetable tissues.

In dry vegetables I found gas; in living plants I did not detect any free gas-bubbles. It is probable that the oxygen and carbonic acid, the two grand factors in the life of the plants, are merely in solution in the sap, like the carbonic acid in the blood of the lung blood-vessels, and not in the form of free gas.

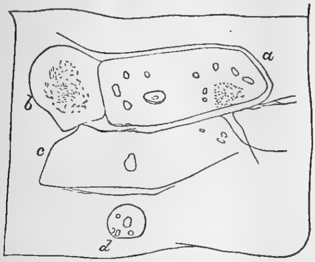
7. The last and most important part of the cell contents is the nucleus or *cytoblast.*

Schleiden says: "In all tender hairs, almost in every growing portion of cellular tissue in the entire leaves of mosses, especially in *Sphagnum*, we find in every cell, fastened to the inner wall, a small, mostly plano-convex or lenticular, sharply defined body, strikingly different from all other contents of the cell. This is the *cytoblast.*"

When perfectly formed it is a flat lenticular, sharply defined, pale yellow body, in which it is easy to distinguish one or two, seldom three, sharply defined, and evidently hollow, corpuscles, which are called "*nucleoli.*"

I was not able to discover the cytoblast in leaves of a moss (*Hypnum molluscum*). I observed at one end a sharper yellowish hue, which in the first moment I took for a cytoblast, but an ampler enlargement showed that it was only the interference of the light in the rounded corner of the cell. In another moss (*Sphagnum fimbriatum*) it is otherwise. The cells of the top, which are evidently of more recent building, are without any trace of a cytoblast, whereas in those of ancient date nearer the root, we distinguish in many cells a yellowish-green globule, which Schleiden took, evidently, for a cytoblast.

[Fig. 217.]



In the hair of the Geranium stem (Fig. 161), in many pith cells of the same (Fig. 217), and of Cactus, the cytoblast was very manifest.

I must state that I was unable to discover a cytoblast in all cells which contained salt in form of crystal, or in that of layers, fibres, or pores, in the cells of ancient date, as the starch cells of the roots which I considered in this paper.

The *fungus* offers a good material for studying the cytoblast. In fungus-cells we find one or more cytoblasts, and we can easily observe their dividing into two, four, etc.

I did not observe a cytoblast attached to the wall of the *primitive utricle* and forming an integral part of it, as related by Schleiden.

We have now passed in review successively all parts of the vegetable cell. I never found, and perhaps there does not exist, a cell which contains all the substances mentioned at once.

VEGETATION seems to extend much farther toward the north, than toward the south pole; thus in Lapland, the Fir-tree extends to 70 deg.; the White-birch to 70 deg. 40 min., and the Dwarf-birch 71 deg.; whereas, in the same degrees of south latitute vegetation is almost wholly wanting. Even in Deception Island, 62 deg. 50 min. south latitude, only Lichens are met with, and no longer any species of grass; and in Cockburn's Island, lat. 64 deg. 12 min., only Lichens and a few mosses are to be found. On the contrary, in the Arctic zone, ten species of flowering plants were found on Walden Island, 80½ deg. north latitude.

"NATURE seems to have accumulated all the beauties of form in the stately Palm, whose smooth and slender stems rise to a height of from 60 to 75 feet, projecting like a colonnade above the dense mass of the surrounding foliage. The leaves of some species incline vertically upwards to a height of 16 to 17 feet, and are curled at the extremities in a kind of feathery tuft. The flower-buds burst forth, in all Palms, from the stem immediately beneath the leaves."

WILD RICE, or INDIAN RICE.
(*Zizania aquatica*, L.)

The muddy borders of lakes and slow streams in the Northwestern States produce a species of wild Rice (*Zizania aquatica*), nearly related to the cultivated grain. It is especially abundant in the small lakes which abound in Minnesota, and is there a means of subsistence for the Indians. It grows usually four to six feet high, sometimes, however, reaching the height of eight or ten feet. The grain is produced from pistillate flowers on the upper branches of the flowering stalk, the lower branches bearing only the staminate flowers. The grain is smaller than that of the cultivated rice, but is said to be sweet and well-flavored, but acquires a scorched taste from the manner of removing the husks.

We find in the *Youth's Companion* an article by Helen C. Weeks, which gives an extremely interesting account of the manner of collecting and preparing the grain for food by the Indians of Minnesota. We give below the principal portion of the article referred to:

"Some months later, in early September, we left Red Lake, and journeyed by canoe from that point to Leech Lake, a hundred miles and more, below. The route lies through a chain of small lakes, connected by streams, sometimes large and sometimes small, but quite as often separated by belts of land called 'portages.'

"At times a field of wild Rice may be found in some shallow spot near the middle of the lakes, but oftener it grows nearer the shore, sometimes many acres together, the long, slender stalks, with their reddish-brown heads of grain rising high above one's head, as the canoe sweeps through them.

"The wives of our Indian boatmen set out at the same time as ourselves for a rice-field in Midge's Lake, and as they row more swiftly than the men, we found them there at work, when we started the next morning, after our first night's camping out on its shores.

"Curious to see the whole operation we waited here an hour or two. In the bottom of the middle of the canoe was laid the blanket; and as the canoe was paddled slowly through the field by one woman, the other, kneeling and holding two sticks, shaped like small paddles, bent over the heads of rice with one, while with the other she brushed out the ripe grains, which fell into the blanket. As it gradually fills, the women paddle to some point on the shore, where a fire is lighted, and the great copper kettle, bought at British forts in Hudson's Bay territory, and only owned by the most well-to-do among them, is swung over it to heat. Into this, when almost red-hot, the rice is poured, and constantly stirred with a small paddle till the husks are scorched off, and the grain thoroughly parched. It is from this process that the scorched taste comes, for freed from the husk in the same way as the Southern rice, it would be quite as sweet. Once roasted, it is put up in bags woven from rushes, and holding generally about half a bushel."

NOTES FROM CORRESPONDENTS.

Kentucky Coffee Tree.—The tree mentioned in the June number of the AMERICAN ENTOMOLOGIST AND BOTANIST as growing near Cardiff, Onondago Co., N. Y., is *Gymnocladus Canadensis*, or the Kentucky Coffee Tree, a very rare tree in this State. Gov. Dewitt Clinton must have been mistaken if he supposed the trees in question were a species of *Zanthoxylum*.

WHITE FRUITED FRAGARIA.—We have a *Fragaria* growing here that resembles *F. vesca* in every respect except the color of the fruit, which is always white. In Skaneateles, in this State, there are literally millions of these plants growing in the fields, always with white fruit, and showing no signs of varying into the proper form of *Fragaria vesca*. Is this white-fruited form common in other localities? If it should be found to retain its white fruit in all places would this constitute it a new species? SAM'L N. COWLES.

SKANEATELES, N. Y., Aug., 1870.

[The mere character of color is not sufficient to establish a specific distinction. We would be glad to have information from other correspondents as to the frequency of this variety of Strawberry.—ED.]

Botanical Notes from Southern Illinois, No. 2.—Since writing my last I have observed, about the bluffs in Union county, *Lespedeza repens* and *Galactea mollis*, both occurring abundantly. In the lower grounds along streams, the first herbaceous plant in bloom is the little *Erigenia bulbosa*, the harbinger of spring, which often pushes up its cluster of tiny blossoms while its leaves are yet unfolded, and sometimes before they are even above the ground. Its early appearance is the more striking, since it belongs to an order whose other representatives bloom in midsummer.

Upon the faces of southward-sloping hills, I have seen masses of *Phlox bifida* in bloom as early as the 25th of March. Later comes the *Synandra grandiflora*, the largest and most beautiful of our labiate flowers, growing in profusion along the Drury and its tributaries. Stagnant pools are often filled with *Ranunculus oblongifolius*, while in low grounds everywhere occur *Delphinium tricorne* and *Trillium erectum*, var. *album*. The Delphinium is always deep purple with us, and the Trillium white throughout. Scattered through damp woods, and growing in masses at the bases of bluffs, I find *Pogonia pendula*, curious, like all the fantastic Orchis family to which it belongs, and interesting also for its rarity elsewhere. Most of these plants, with many others interesting and beautiful, may be found in the Stone-Fort Valley, a narrow creek bottom bordered by perpendicular walls of rock, near Makanda, in Jackson county. Opposite an ancient fortification, from which the valley takes its name—a relic of the early French or Spanish voyageurs—is the only spot where the Saxifraga mentioned in your August number has yet been seen. The scarred and buttressed bluffs of this valley are rich in mosses and ferns, lichens and liverworts.

In swampy ground is sometimes seen *Pancratium rotatum*, almost worthy to contest the palm for beauty and fragrance with the peerless White Water-lily. It does not bloom here until July or August. It furnishes an illustration of the ingenious care which Nature sometimes takes to secure the direct fertilization of the ovule, a process which, in other cases, she is equally careful to leave to the chance assistance of insects, or the fickle winds. The thickened points of the three outer divisions of the calyx are curiously notched, so as to hold the tips of the sepals together until the anthers have discharged their pollen and the impregnation of the ovule is made certain; and then the flower opens, usually with a sudden spring. A very common plant in low grounds is *Desmodium pauciflorum*, remarkable as being perhaps the only member of the sub-order Papilionaceæ whose petals are entirely distinct.

In thickets I find *Sicyos angulatus*, and in the drier woods *Coreopsis auriculata*, *Archangelica hirsuta*, *Fedia radiata*, *Cynthia Virginica*, *Corallorhiza odontorhiza* (rare), and *Lithospermum latifolium*, the latter widely scattered through the forests of Jackson county. *Sabbatia angularis* often appears here with pure white flowers.

Among the common roadside plants are *Heliophytum Indicum* and *Eupatorium serotinum*. At the base of bluffs appears *Polymnia Canadensis*; and in rich and shaded soil *Phacelia bipinnatifida*, bearing round racemes of light-blue flowers, but coarse in foliage and offensively rank in smell. Very common, not in swamps, but by banks of streams and in low open grounds everywhere, is *Ludwigia alternifolia*.

The flora of the Mississippi bottoms is not so varied and peculiar as that of the higher lands. Almost the only unusual plants which I have observed there are *Myriophyllum heterophyllum* and *Hottonia inflata*, occurring in stagnant ponds. *Jussiæa repens* occurs somewhat rarely here, but is very common further south.

The tortuous and shallow lakes, lying usually near the eastern boundary of the bottoms, are filled with the ordinary vegetation of quiet waters. I have seen acres of their expanse gorgeous with the purple and green-and-gold of the Pickerel-weed, and some are filled with the stately and beautiful *Nelumbium luteum*, the under surfaces of whose broad peltate leaves, when swept by the wind, flash in the sun like silver. More commonly, however, they are simply bordered with the Arrow Arum, and the yellow and white Pond-lilies; while the dark-brown surface of the open spaces will be starred with the golden blossoms of the larger *Utricularia*. On the borders of Grassy Lake I found *Anemone Pennsylvanica* and *Smilax tamnoides*, and upon the summits of some Indian burial mounds on Running Lake, the only specimens of *Gleditschia monosperma* I have seen in the county.

I will add to the above list a few I observed in Franklin county, as *Polygala Nuttallii* and *P. ambigua*, both very common; *Myriophyllum scabratum* in swamps, and in thickets upon the hills *Phaseolus pauciflorus*, *Stachys palustris*, varieties *aspera* and *glabra*; *Asclepias purpurascens*; *Croton capitatum* by roadsides; *Smilax pseudochina*, and a *Herpestris*, not *rotundifolia*. S. A. FORBES.

ANSWERS TO CORRESPONDENTS.

Plants to Name—*Daniel Witter, Denver, Colorado.*—I inclose the flower, seed-pod and a branch of a very beautiful and singular plant which grows most luxuriantly on our driest and most sandy plains. I would like much to know its name. Its root is perennial, I think, and runs down to a great depth. I have seen bunches of it from one root 8 feet across and 3 feet high.

Ans. The specimen sent was *Ipomea leptophylla*, or what might be called the Western Morning-glory. It occurs frequently on the "Great Plains," and when in flower presents a beautiful appearance.

THE AMERICAN Entomologist AND Botanist.

VOL. 2. ST. LOUIS, MO., DECEMBER, 1870. NO. 12.

Entomological Department.

CHARLES V. RILEY, EDITOR,
Room 29, Insurance Building, St. Louis, Mo.

THE YEAR'S INTERMISSION.

We have been highly pleased at the numerous gratulatory letters which have come to hand since our last number was sent out. General regret is expressed, and some few of our subscribers express the fear that the publication of our journal will never be recommenced. Indeed, some of our contemporaries have even announced that the "AMERICAN ENTOMOLOGIST AND BOTANIST has been discontinued." Now we must here reiterate that which we have already announced. Our journal is not discontinued, but simply suspended for one year, in accordance with the desires of both publishers and editors. Like those insects which, after an active larval period, go through a pupal stage during which the life functions are in great part suspended, and which yet afterwards burst forth in all their glory and perfection; so we intend that our journal, after its temporary suspension, shall in due time appear, before those who signify their desire to receive it, in a more attractive and perfect form.

It is because of this our firm intention that we desire all those who contemplate taking Volume III to send in their names (not the money) at once to the publishers. The greater the list the more we shall feel encouraged to go on, and every present subscriber who desires the success of our enterprise should endeavor to send in at least one more name with his or her own.

In taking temporary leave of our readers we cannot forbear to express our sincere thanks to those editors who have so favorably noticed this paper, and to the many friends who, by their contributions and aid in other ways, have laid us under lasting obligations.

BOUND VOLUMES.—The publishers will furnish this volume complete and nicely bound for $2.50 per copy. Only about 20 copies of Vol. I remain, which will be disposed of at the same price.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 13.

The Grape-leaf Gall-louse,
(*Phylloxera vitifoliæ*, Fitch.)

[Fig. 218.]

Color—Green.

Here we have an insect, the life-history of which is as interesting to the entomologist as its devastations are alarming to the grape-grower. We have given it considerable attention the past summer, and though it is a difficult task to present definite and satisfactory information from among the multitude of facts we have obtained, yet we shall endeavor to lay before our readers a comprehensive account of this little louse, so far as our present knowledge of it will permit. In doing so we are made painfully aware that there is much room left for further observations, and he who will patiently and persistently devote his time for a few years to its study, and will with candor and accuracy give to the world the results, will doubtless be rewarded by new and important discoveries, and will render valuable service to the cause of science and of economic entomology.

The first reference to this insect was briefly made by Dr. Fitch, of New York, in the year 1856,* and he subsequently described it in a very insufficient manner, under the name of *Pemphi-*

* N. Y. Rep. I, p. 158.

gus vitifoliæ;* but though the specific name must be retained, the insect was wrongly referred to the genus *Pemphigus*, as we shall presently see. Ten years afterwards this louse was again referred to by ourselves in the *Prairie Farmer* for August 3, 1866, and during the fall of the same year articles were written upon it by Dr. Shimer,† and by our late associate, Mr. Walsh‡—the former claiming that it was a true Plant-louse (*Aphis* family), and the latter that it was a Bark-louse (*Coccus* family). In this Dr. Shimer was evidently right, and Mr. Walsh wrong. In January, 1867, Dr. Shimer proposed for this insect a new family (DACTYLOSPHÆRIDÆ§), which, in our opinion, cannot stand.

But not to weary the general reader with purely scientific questions, we shall presently give, in a short appendix, the reasons for our opinion on this point, together with some other details for the benefit of those more immediately interested.

This louse was subsequently treated of by Mr. Walsh in his report as Acting State Entomologist of Illinois (pp. 21–24), where he still felt inclined to place it with the Bark-lice, though we have good reason to believe that he afterwards changed his mind. During all this time a serious disease of the roots of the Grape-vine began to attract attention in the south of France, and it finally caused such alarm that the Minister of Agriculture and Commerce in France offered a prize of 20,000 francs for the discovery of an efficacious and practical remedy.

A special commission was also appointed to draw up a programme of conditions, examine memoirs submitted to it, settle the experiments to be made, collect evidence from local commissions, and, if they saw reason for so doing, to award the prize offered by government. The commission consisted of M. Dumas, M. Milne Edwards and M. Duchartre, of the Paris Academy of Sciences; M. Gervais, M. Planchon, M. Henri Mares and M. Louis Vialla, of Montpellier; the Comte de Vergue, of Gironde; M. Bedel, of Vaucluse, and three members of the Ministry of Agriculture.

The disease is known as *pourridie*, or rotting. It is in the form of little cankerous spots, which cut off the supply of nourishment and cause the roots to rot, and these spots were ascertained by MM. Planchon and Lichtenstein, of Montpellier, to be caused by a louse (*Phylloxera vastatrix*, Planchon), which bears a close resemblance to our gall insect. This is not all, for a leaf-gall absolutely identical with ours also occurs there, and the identity of the gall-inhabiting with the root-inhabiting insect was demonstrated by "J. O. W." in the *Gardener's Chronicle*, of England, for January 30, 1869, and M. J. Lichtenstein even contended that their European species was identical with ours, and imported from this country, in which opinion he was supported by A. Combe-Dalmas.*

Of course these views expressed in Europe gave increased interest to our own gall-louse, and we determined to make every effort to decide the question of identity, together with some other questions which presented themselves. To this end we opened correspondence with M. V. Signoret and M. J. Litchtenstein, who were making experiments in France while we were doing the same here. But the blighting effects of the war have not only entailed untold misery and woe to millions in France, but have either paralyzed or effectually balked scientific investigation within her borders, so that at last accounts M. Lichtenstein was in Spain, and M. Signoret shut up in Paris. We were, however, fortunate enough to receive from the latter gentleman, a few days previous to the investment of Paris, a letter stating that upon examination of specimens of our gall-lice, which we had expressed to him, he was convinced of their identity with the European species. This was indeed satisfactory, and, coupled with the facts that we have discovered that our gall insect likewise attacks the roots of our vines in precisely the same manner as does the European species, and that the winged specimens found in this country by Dr. Shimer agree in having the characteristic dusky band around the middle of the thorax described in the winged female of Europe, it leaves no doubt in our mind that the insects of the two continents are really identical.

As already stated the war put a stop to investigations in France, and we do not know that any effectual remedy was discovered, or that the premium was disposed of. Carbolic acid, and two other substances, namely, sulphuret of lime dissolved in water, and an empyreumatical oil, known among veterinary surgeons by the name of "oil of cade," dissolved in water, were found to be the best specifics; but neither of them have been tried on a sufficiently extensive scale, and we have little faith in any medicinal remedy.

The two parties who have written most upon the disease, namely, M. Signoret and M. Lichtenstein, took entirely opposite grounds as to its cause. The former claimed that it had a botan-

* Rep. 3, § 117.

† *Prairie Farmer*, Nov. 3 and Dec. 8, 1866.

‡ *Pract. Ent.*, Vol. I, p. 111; Vol. II, p. 19; and Proc. Ent. Soc., Phil., VI, pp. 283-4, notes.

§ Proc. Acad. Nat. Sci., Phil., Jan., 1867.

* *Insectologie Agricole*, 1869, p. 189.

ical rather than an entomological cause, that it was principally due to drouth, bad culture and poor soil, and that the *Phylloxera* was therefore incidental; and acting upon this view, suggested that water, with manure and good cultivation, would do away with it; while the latter maintained that the *Phylloxera* was the sole cause of the trouble. There are, doubtless, certain conditions of soil which will prove favorable to the increase of the louse, and it may also be influenced by the seasons and by good or poor cultivation; but that this insect should be found only on such roots as are already diseased is highly improbable, and there can be no reasonable doubt that M. Lichtenstein is right in attributing the disease directly to the *Phylloxera*. The appearance of mites is the almost inevitable consequence of diseased and rotting vegetation, but Plant-lice cannot live on such vegetation, and invariably leave it as soon as they have by their punctures reduced the healthy tissues to such a state. Moreover, the history of our own louse, which we shall now proceed to give, corroborates M. Lichtenstein's views.

In Missouri this insect has proved very injurious to the Clinton vine for several years past—at least as far back as 1864—and Mr. Geo. Husmann informed us that last year it actually defoliated three-fourths of an acre of Clintons and Taylors on bottom land at Bluffton, though it did not appear to do much injury on the hills. The past season it has been very bad around Kirkwood, where we had an excellent opportunity to carry on our observations.

In this latitude the first galls are noticed by about the middle of May, and by the middle of June they begin to be quite common. It occurs most abundantly on the Clinton and Taylor, but we have found it on the wild Frost Grape (*V. cordifolia*), and such other cultivated varieties of it as Golden Clinton and Huntington; also on the Delaware, and early in the year we even found a few large galls on the Concord. According to Dr. Morse it also occurs on the Iona, which is a variety of the Northern Fox Grape (*V. labrusca*). The galls vary somewhat in appearance, according to the vine upon which they occur, those we have noticed on the wild Frost Grape being more hirsute than those on the cultivated Clinton, and these again rougher than on the Taylor.

The few individuals which start the race early in the year station themselves upon the upper side of the leaves, and by constant suction and irritation soon cause the leaf to swell irregularly on the opposite side, while the upper part of the leaf gradually becomes fuzzy and closes, so that the louse at last sinks from view, and is snugly settled in her gall. Here she commences depositing, her bulk increasing during pregnancy. Eventually she grows to be very plump and swollen, acquires a deep yellow or orange tint, and crowds the space within the gall with her small yellow eggs, numbering from fifty to four or five hundred, according to the size of the gall. The young lice are pale yellow, and appear as at Figure 219, *d*, *e*. As soon as they are hatched they escape from the gall through the orifice on the upper surface of the leaf, which was never entirely closed; and, taking up their abode on the young and tender leaves, in their turn form galls. The mother louse, after completing her deposit, dies, and the gall which she occupied dries up. There are several generations during the year, and this process goes on as long as the vines put forth fresh leaves. As the galls multiply and the growth of the vine becomes less vigorous, the young lice sometimes so completely cover the upper surface of the newly expanded leaves as not to leave room for them all to form galls. In this event the leaf soon perishes, and the lice perish with it. When two or more lice are stationed closely together they often form but one gall, which accounts for the presence of the several females that are sometimes observed in a single gall. Those leaves which have been badly attacked turn brown or black, and sooner or later fall to the ground, so that the vine may become entirely denuded. By August the insects generally become so prodigiously multiplied that they often settle on the tendrils, leaf stalks, and tender branches, where they form excrescences and gall-like growths, differing only from those on the leaves in such manner as one would naturally expect from the difference in the plant tissues. By this time the many natural enemies of the lice begin to play sad havoc with them; and after the vine has finished its growth the young lice, finding no more succulent and suitable leaves, begin to wander and to seek the roots, so that by the end of September the galls are deserted, and those few remaining on the vines generally become mildewy, and finally turn brown and dry up. Upon the roots the lice attach themselves singly, or in little groups, and cause by their punctures little swellings and knots, which eventually become rotten. Where vines have been badly affected with the gall it is difficult to find a perfectly healthy, fibrous root. Strange enough, these lice not only change their residence as winter approaches, from the leaf above ground to the root below ground, just like the Moor, who, having passed the summer on his roof, gets into his house in the winter; but, Proteus-like, they change their appearance in shedding their skins, and at the present time (Nov. 6th) have all become tubercled, as represented at Figure 219, *g*.

No doubt the insect passes the winter on the roots in this tubercled state, but whether in the spring these tubercled individuals produce winged males and females, which rise in the air, pair, and by depositing eggs give birth to the apterous females which found the gall-producing colonies, or whether, as spring opens, they lay eggs on the roots, and the young hatching from these eggs crawl up on to the leaves and found those gall-producing colonies, are questions yet to be settled in the life-history of our Grape leaf-louse. The former hypothesis is, however, by far the most probable, for analogy would lead us to infer that winged males and females must be developed at some time during its annual course, and winged males are so rare in the galls that we have never been able to find them, though we have opened thousands upon thousands of the galls during the summer and fall months. Dr. Shimer, indeed, is the only fortunate individual who has found the winged insect in the galls, and, as he himself tells us, he only succeeded in finding four specimens in the fall of the year, after cutting open ten thousand galls; and he has really given us no proof that his winged specimens were really males, and not females. Let us hope, however, that by pointing out the gaps in the biological history of this insect, attention will be drawn to them, so that they may be the more readily filled.

These discoveries lead us to some most important practical considerations. It now becomes evident that this insect can be transported from one place to another on the roots, either upon transplanted vines or in earth containing fibrous roots. Doubtless it was by some such mode as this that the insect was introduced into France from this country. It may be in this manner likewise that it has in part spread from one portion of our country to another, though as it is found indigenously on the wild Frost Grape, the greater probabilities are that it exists wherever this wild grape is found, and has gradually spread from it on to the cultivated varieties. These probabilities are strengthened by the fact that new grape wood is always rooted in the spring, when the lice, according to our views, are leaving the roots. But the important fact remains, that the insect winters on the roots, and that to exterminate it from a vineyard we have but to root up and destroy, late in the fall, such vines as were affected with the galls. From the poor success that has attended the experiments made abroad to destroy the lice on the roots, and from the fact that it is so difficult to reach them, we have little hope that any other remedy will be found than that of extermination by the means indicated, or by plucking and destroying the gall-infested leaves as fast as they appear in the spring.

Another very important practical lesson may be derived from the facts we have mentioned, namely, that no variety of the Frost Grape (*V. cordifolia*) should be cultivated and encouraged where those of the Fox Grape (*V. labrusca*) or of the Summer Grape (*V. æstivalis*) are known to be as good. Some of our best grape-growers, especially in the Mississippi Valley, already discard the Clinton and its nearest relatives as worthless, and, considering its liability to this disease, we heartily commend their conduct.

There is some difference of opinion among botanists and experienced grape-growers as to the number of indigenous species of the grapevine, and as to the true character of some of the cultivated varieties. Some botanists are inclined to the opinion that we have but two, or even but one, species; and certain it is that the fertile character of the hybrids would lead to such an opinion; but it is more generally accepted that we have four distinct species (*V. labrusca, æstivalis, cordifolia* and *vulpina*) and this view is held by most western men.*

As already stated, our Grape leaf-louse is now principally confined to varieties of the Frost Grape;† but as it has been found in limited numbers on Iona and Concord, which are considered as varieties of the Northern Fox, and on the Delaware, which is considered either as a Summer Grape or as a hybrid between the Summer and the Northern Fox, we fear it may yet spread and become injurious to these species. Moreover, now that we know that our insect is identical with that of Europe, there is also great danger that it will attack all hybrids with the European *Vinifera*, some of which, as the "Goethe," now promise well. Thus the reasons for discarding the Clinton and other Frost grapes become multiplied, for their cultivation may endanger the whole grape-growing interest of the country. On entomological grounds, we say emphatically to western men, do not plant any more Clintons, and get rid of those you now have as quickly as possible.

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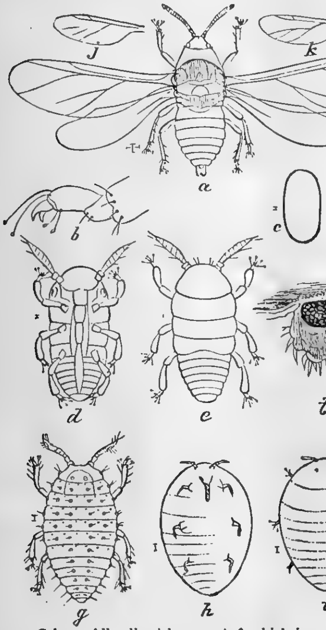
*See Husmann, Grapes and Wine: Flagg, Hearth and Home, Sept 3, 1870: Spaulding, Lecture delivered at the Illinois State Fair, 1870.

† Though Gray considers the Clinton a variety of the *Æstivalis*, it is more generally considered as belonging to *Cordifolia*, which its great liability to the gall-louse would indicate.

We had intended to say something about the several insect enemies of this louse, but the illustrations could not be prepared in time, and our space will not permit.

[Fig. 219.]



Colors—All yellowish, except *f*, which is green.

Figure 218, at the head of this article, represents a leaf covered with galls. Figure 219—(*a*) represents the winged female; (*b*) her foot or tarsus—after Signoret; (*c*) an enlarged egg; (*d*) the newly hatched gall-inhabiting type, ventral view; (*e*) same, dorsal view; (*f*) a section of a gall; (*g*) the tubercled root-inhabiting form; (*h*) the mother gall-louse at the heighth of her fertility, ventral view; (*i*) same, dorsal view—all from nature; (*j* and *k*) differently veined wings of the Oak *Phylloxera* of Europe. All these figures are greatly enlarged, and the natural size is approximately shown by hair-lines.

APPENDIX.

It will be remembered that in what was said about this insect on page 248 of our first volume we criticised the founding of the Family *Dactylosphæridæ* by Dr. Shimer. In an essay read before the Illinois State Horticultural Society at Ottawa last winter, Dr. Shimer took exception to our remarks, and called upon us to give a reason for the faith that is in us. Not considering a horticultural meeting the proper place to enter into the discussion of purely entomological questions, we declined to waste the precious time of the members, but intimated that we should be glad to answer the Doctor whenever a favorable occasion presented. The opportunity did not offer till now, as the Transactions of the Society, containing the essay in question, have but recently been published, but as we ourselves wrote the strictures, we will briefly give our reasons for so doing. In order to lay the question clearly before those interested, it will be necessary to quote that portion of our former article which so exercised friend Shimer. It runs as follows:

> The louse which forms the gall was first described as *Pemphigus vitifoliæ* 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 (*Dactylosphæridæ*) and of a new genus (*Dactylosphæra*). The distinguishing features of this supposed family are certain appendages attached to the legs which Dr. Shimer calls *digituli*, 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 (*Lepidosaphes*) 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 almost all Bark-lice.

And here is Dr. Shimer's appeal:

> Here they would like to make the public believe that these appendages, *digituli*, are the characters out of which I have proposed two families in Entomology; whereas, the leading character upon which I propose my family *Dactylosphaeridæ*, is two claws on a one-jointed tarsus, and the leading characters in *Lepidosaphidæ* are a tarsus without a claw, and a *scale-making*, not a scale-like insect. The digituli from their globe-ended extremities I consider of some importance, but by no means of primary weight in the first named family, and in the second family I give them no more than secondary importance. What reasons the junior editor, for he alone now becomes responsible, can assign for so gross misrepresentation I am not able to anticipate. He certainly, however, will be able to give some reason for the faith within him. * * *
> I have not the slightest personal feeling in the matter, and I hope that my much respected friend, Mr. Riley, State Entomologist of Missouri, will be free to defend the position he has thus taken against me.

Now, we believe Dr. Shimer is sincere in stating that he has no personal feeling in the matter, else we should not even notice his request. We hope, therefore, that he will believe us when we state that in the few words we are about to pen we are governed by no personal considerations whatever, but by a love of truth for truth's sake. As Dr. Shimer becomes more familiar (and we hope he will so become) with the minute and interesting insects to which he has more especially turned his attention, he will no doubt regret that he ever proposed those two families without longer pondering and considering.

Regarding the Bark-louse, we will dismiss the subject in a few words, as it is foreign to the topic under consideration. Dr. Shimer, it is true, deserves severe handling for the cool and skeptical manner in which he refers to the work of all preceding entomologists, and the laughable way in which he arrogates to himself the power of correct observation;* but at present we

*Trans. Am. Ent. Soc. I, pp. 371-2.

will simply accede to his request, as follows:

We confess that in stating that Dr. Shimer had based his new family, LEPIDOSAPHIDÆ, upon the occurrence of *digituli*, we should have qualified our language by inserting "partly" before "upon," since the characters as given by him are, "*Four digituli terminated by pulvilli or arolia, and no claw, and the female living beneath a scale or shell-like habitation of her own constructing.*"* But we insist that the proposition of a family on such grounds was not only unfortunate, but unwarranted, for the following reasons: First, the so-called *digituli* are not even of generic, much less of family value, as they are really nothing but modified hairs, and occur in a more or less perfect form in all young *Coccidæ* and *Aphidæ* which we have examined, and are acknowledged by the best authorities to be common to both these families. Secondly, the insect in question really has a more or less perfect claw, as we have abundantly demonstrated the present year. Thirdly, the assumption† that the scale in all COCCIDÆ should be part and parcel of the insect itself, is a purely gratuitous one, since there are many other species which live separate from their scales, and since the genus *Aspidiotus* was especially erected by Bouché for those species which thus live *under* and separate from them. Consequently there remains not a single character mentioned by our author but what is well known to belong to the COCCIDÆ, and there is not even the slightest excuse imaginable for separating it from Costa's genus *Diaspis*, to which it is now correctly referred by Signoret—our highest authority on this family.

Now let us return to our Grape-leaf louse. We have no trouble in proving by Dr. Shimer's own words that we were perfectly justified in saying that the "*digituli*" were the "*distinguishing* features" of his supposed family *Dactylosphæridæ*. The very meaning of the word (globe-fingered) given to the family indicates such to have been the case, and he himself expressly says: ‡"The wing neuration of *Dactylosphæra* is synonymous with that of *Phylloxera*; it is, therefore, upon the other characters that I found this genus." Now what are the other characters? Turning to the family characters given, we find: "Wings four, carried flat on the back in repose. Antennæ few-jointed. Tarsi composed of one joint terminated by two claws, and from two to six *digituli*. Honey tubes none; otherwise resembling *Aphidæ*."§ The only other character given which is not Aphidian is the one-jointed tarsus, which, as we shall presently show, cannot, strictly speaking, be considered a character of our Gall-louse, and which, even if it were, would scarcely warrant the making of a new family. Every other character, including the "*digituli*" is common to dozens of plant-lice, and the neuration of the insect's wing‖ places it beyond any doubt in the genus *Phylloxera*, which has long been ready to receive it, and which, with the genera *Vacuna* and *Chermes*, form the sixth Tribe, *Chermesinæ*, of the APHIDIDÆ, according to Passerini's latest revision of this family.

We can commend the carefulness with which Dr. Shimer made the interesting observations which he has given us on this insect, but no man should undertake to found new families without first informing himself more thoroughly of what has already been done by others.

It was by no very easy means that we arrived at the conclusion that our Gall-louse is identical with the European species, but now that the fact seems sufficiently proved, Planchon's specific name *vastatrix* will have to give way to Fitch's *vitifoliæ*,* or at the most be retained as a variety.

At first there seemed to be many reasons for considering the two insects distinct. First, the European root-louse was exceedingly destructive, and their gall-louse of only exceptional occurrence; while our gall-louse was very common and destructive, and no root-lice were known to exist here at all. Secondly, the insect found in the galls was smooth, while that on the roots was distinctly ornamented with piliferous tubercles, and the two were sufficiently unlike to cause M. Lichtenstein, who believed in their identity, to propose the term gall-inhabiting (*gallicole*) for the one race, and root-inhabiting (*radicicole*) for the other. Thirdly, our insect was described as having a one-jointed tarsus, whereas M. Signoret described and figured the tarsus of the winged root-inhabiting form as two-jointed. Fourthly, there seemed to be a difference even in the form of our gall-inhabiting louse and theirs, as ours appeared much more obese and globular than theirs, as represented in their figures. All these apparent differences were rather calculated to give rise to doubts as to the identity of the two insects; but by careful observation and persistency we have been enabled to dispel them all.

First, we might naturally expect—and those who believe in the Darwinian hypothesis certainly would—that, presuming our insect to have been imported into Europe, it would undergo some modification in its habits, not only because of change of climate, but because of its having to live on another species of the Grape-vine—all the European species belonging to *Vitis vinifera*. Hence its normal habit there, of feeding on

*Trans. Am. Ent. Soc. I, p. 372.

†Ibid, p. 371.

‡ *Characters for a supposed new family*, p. 5, note; from the Proc. Acad. Nat. Sci. Phil., Jan. 1867.

§Ibid, p.1.

‖The neuration of the wing differs slightly from the typical European *Phylloxera quercus*, in the two discoidal veins of the front wing uniting in a fork instead of being perfectly separated. On this account Mr. Walsh proposed for our insect, and for certain other species found in hickory galls, which have the same neuration, the generic name of *Xerophylla*. But it seems to us that the polymorphism of APHIDÆ has not yet been sufficiently investigated to allow of making even different species, much less different genera, upon a forked or unforked nervure, for there is frequently much greater difference in specimens coming from the same parents; and, as we are informed by M. Lichtenstein, the European *Phylloxera* of the Oak actually presents both kinds of neuration; there being red specimens with unforked nerves (Fig 219, *j*), and yellow specimens with forked nerves (Fig. 219, *k*). We have in our possession the very drawing made by Mr. Cresson from Dr. Shimer's specimen of *vitifoliæ*, which Mr. Walsh refers to in his Report, and which led Mr. W. erroneously to place our louse with the Coccids. The drawing is rough, evidently imperfect, and well calculated to mislead, for the discoidal nerve of the front wing is represented more as a fold, the forks are omitted, and the costa of hind wing is represented perfectly straight. The drawing is also accompanied by Mr. Cresson's statement that he could not give any decided opinion as to the neuration, as the wings on the specimen were not spread out.

*M. J. Lichtenstein has objected to Fitch's specific name "*vitifoliæ*" on the score of its being ungrammatical, and has substituted the term "*vitis-folii*" in his published reports. We cannot see any reason for being so ultra nice in this matter. Irregularities in entomological nomenclature seem to be allowable, or at least are very frequently and purposely perpetrated for the sake of euphony. "Whatever is, is right," is as true in language as it is in religion, and if we alter *vitifoliæ* we must alter a thousand other entomological names that are not, strictly speaking, grammatically correct.

the roots, may have been gradually acquired. We believe a parallel case presents itself in our Apple Root-louse (*Eriosoma pyri*, Fitch) and the Woolly Aphis, or so-called "American Blight" (*Eriosoma lanigera*, Hausm). It is conceded on almost all sides* that the last insect was imported into Europe from this country, and there is now every reason to believe that the two insects are indentical, or that at furthest they can only be considered as varieties of one species. Yet while in this country our root-louse is very injurious in the West, and only exceptionally found on the limbs above ground (though more often so found in the Eastern States); all authors that we are acquainted with have spoken of it as occurring solely on the limbs in Europe; though M. Lichtenstein informs us that he has found it on the roots there also, and that in those cases it caused just such swellings of the roots as our root-louse does here. We know in St. Louis of an old apple-tree, standing in a yard where the ground is trodden hard, the limbs of which have been for the past three years more or less affected with this insect, though none can be found on the roots. But where the ground is more porous, and not so closely pressed to the roots, it seldom occurs on the branches, but often on the roots, even in the immediate neighborhood. Upon the closest examination we cannot find the slightest difference between the root and branch-inhabiting lice, and no doubt their habitat is governed somewhat by the character of the soil, though in this country their normal habit is to attack the roots, and to appear above ground only occasionally in the fall.

Secondly, we have proved, by transferring on to roots the young grape-lice hatched from galls, and by successfully feeding them on those roots, that our smooth gall-inhabiting type gives birth to the tubercled root-inhabiting type; and we have discovered that our gall insects take to the roots in the fall, on which they cause the same cankerous spots and swellings as does the *vastatrix* of Europe, and on which they evidently hibernate just as *vastatrix* is known to do.

Thirdly, although in the gall-inhabiting type, in both countries, the tarsus seems to be one-jointed, yet in the root inhabiting type it is really two-jointed; for though the basal joint is small, and not visible from above, it is plainly visible from the side or from below (See Fig. 219, *b*). We have here what certain speculative entomologists would consider an excellent illustration of the inferiority of Coccidæ compared with the Aphidæ, namely, a true Aphidian, exhibiting in its larval and agamic stage the one-jointed tarsus of a Coccid, and only showing the two-jointed tarsus of its family in the more perfected tubercled form, and in the winged state. And this Coccid-affinity in the less perfect gall-producing state is sometimes carried still farther, as we have often been unable to discern but a single claw to the tarsi of some of the young gall-inhabiting individuals.

Fourthly, the fact that M. Signoret, who alone has compared actual specimens from both countries, decides them to be identical, would sufficiently indicate that the difference noticeable in the form depends on the observer, and on the stage of growth at which observations are made.

It was the one-jointed tarsus in the gall insect which no doubt in part led Dr. Shimer to propose a new family for it, and it was this character—coupled with the facts that it is oviparous, that it does not secrete any sugary or flocculent substance (as do most gall-inhabiting Plant-lice), and that the young forsake the gall and scatter over the leaves as soon as hatched—which led Mr. Walsh to consider it as an anomalous and aberrant Coccid. The genus *Phylloxera* seems also, according to Westwood, to have been doubtingly introduced into this family by Curtis in his Guide. We have already shown that, in the root-inhabiting form, the two joints of the tarsus are plainly to be seen; and Dr. Shimer himself admits* that, in the winged insect which he found in galls, he noticed a constriction on the under side of the tarsus, though he is unwilling to allow that it was a joint, because there was no motion. But even if the 2-jointed character of the more perfect louse were not demonstrated, all the other characters are so unmistakably Aphidian that there is, we think, no warrant in making a new family. In such degraded insects, where the antennal joints are so variable, we might naturally expect to find variation in the joints of the legs. The more familiar we become with the biological secrets of Nature, the more do we find, not only species but genera, and even families, approaching each other through modifications found in individuals; and these aberrant gall-lice only help to give us a better idea of the close connection between the COCCIDÆ and APHIDÆ. Our *Phylloxera* brings the two families close together, by its affinities on the one side with *Chermes* of Linnæus, which, though looked upon as a Coccid by Ratzeburg, is generally considered an Aphidian, and on the other with the Coccidan genus *Dactylopius* which contains Linnæus's *Coccus adonidum*. The oviparous nature of these gall-lice will also have less significance when we reflect that there is a sort of gradation in this process, and that many Plant-lice which are considered viviparous or ovoviparous do in reality bring forth their young enveloped in a more or less distinct egg-like film or covering, from which they have to free themselves by a process analogous to that of hatching. This has not only been observed by Curtis, in the case of an *Aphis* found on the turnip,† but by Dr. Wm. Manlius Smith, of Manlius, N. Y.,‡ in the case of *Pemphigus*; and we have, the present year, assured ourselves of the accuracy of Dr. Manlius's observation as to *Pemphigus*, and witnessed the same thing in *Eriosoma*, namely in *E. pyri*, Fitch. In this last case the newly deposited louse [or egg] remains motionless for a considerable time; and the covering, after the young louse has extricated itself from it, may be as distinctly seen attached to the end of its body as the covering or egg-shell of our Grape gall-louse, and was figured by Fitch, who mistook it for the cotton-like matter, which, however, is not secreted till the louse fastens itself and begins to grow.§ Moreover those Aphidians which are viviparous through the spring and summer months, generally lay eggs in the fall; and though agamous and viviparous multiplication can be prolonged by submitting the lice to a continued artifically warm temperature, there is doubtless a limit to this prolongation; and it may be laid down as a rule that, with most Aphidians, the ♂ element and the production of eggs are, at some time or other, indispensable to the continuance of the species.

* M. Eudes-Deslongchamps and M. Blot are the only authors, according to Amyot and Serville, who believe it is indigenous to Europe.

* *Characters of a Supposed New Family*, p. 3.
† Farm Insects, p. 65.
‡ Auctore Walsh, P. E. S. P. VI, p. 282, note.
§ N. Y. Rep. I, p. 9.

THE CHALCIDEOUS PARASITE OF THE APPLE-TREE BARK-LOUSE.

(*Chalcis* [*Aphelinus*] *mytilaspidis*, n. sp.*)

BY DR. WM. LE BARON, GENEVA, ILLS.

[Fig. 220.]

Color—Yellow. (*a*) Fly; (*b*) antennæ; (*c*) larva.

It is the general opinion of nurserymen and orchardists that the Oyster-shell Bark-louse of the apple tree has, for a number of years past, been gradually disappearing, so that it no longer occupies the rank which it has heretofore so pre-ëminently held, of a first-class noxious insect.

The causes which have been instrumental in bringing about this result, and which are still operating to its completion, are matters of much interest. The agencies to which it has been usually attributed are the four following: Insectivorous birds; predaceous insects, especially the Coccinellæ, or Lady-bugs, and their larvæ; the larvæ of the parasitic Chalcis-flies; and the Mites or *Acari*.

It has been generally supposed that the smaller insectivorous birds, such as the wrens and warblers, devour many of the eggs of the Bark-louse; but these eggs are so minute, and so completely concealed under the bark-like scales, that even the sharp eyes of a bird could scarcely detect them, unless it were endowed with a special instinct for the purpose, and I know of no record of any actual observations which confirm this supposition. I am therefore inclined to the opinion that birds have done little or nothing in the way of exterminating the Bark-louse.

The Coccinellæ devour a very small proportion of these insects, whilst they are in their incipient and active state; but this lasts only three or four days, and therefore but very few of them can be thus destroyed. These predaceous insects, and especially their larvæ, also destroy a few of the Bark-lice, in their subsequent stages, by gnawing ragged holes through the scales, and thus getting access to the insect beneath. Mr. Walsh conjectured that these rough holes were made by Acari, but I have repeatedly seen the larva of the Two-spotted Coccinella in the act of gnawing just such holes in the scales of the Bark-louse of the pine tree, and devouring its contents, and it is therefore probable that they are the authors of the similar holes on the apple tree. But the small number of scales eaten into shows that but few bark-lice are destroyed in this way.

The destructive work of the Acari is supposed to be indicated by the brownish, discolored remnants of the eggs from which the contents seem to have been extracted, easily distinguished from the pure white shells from which the insects have been hatched. Both Mr. Walsh and Dr. Shimer, who were the first to notice these mites, attribute much efficacy to their depredations, but that they are the sole authors of this work is rendered somewhat doubtful by the fact, that in some localities, at least, where the scales containing these discolored eggs are not uncommon, the Acari are comparatively rare. Of eighty-one scales just examined (Sept. 26), containing these shriveled and discolored eggs, in only four were Acari seen. It is possible, however, that they may have left them after having extracted their contents.

But, besides the ragged holes above mentioned as the work of the Coccinellæ, a much larger number of scales are found through which has been bored perfectly smooth and round, or slightly oval, holes, which we know from analogy must have given exit to some parasitic fly. These holes have been particularly mentioned by several of our entomological writers, and must have been seen by all who have made a special study of the Apple-tree Bark-louse.

So long ago as the year 1855, Dr. Fitch in his first report upon the noxious insects of New York, gave a history of this Bark-louse, so far as it was

* This insect belongs to the genus *Aphelinus* of Dalman, and comes into Mr. Walker's fourth section, which contains the similar European species, *Aphelinus flavus*. The following description gives the principal characters, both generic and specific.

GENERIC DESCRIPTION.—♀ Head a little wider than thorax; antennæ 6-jointed, first joint elongate, the other five forming a fusiform club of which the first and fourth joints are equal, second and third very short, fifth longest; mandibles three-toothed; palpi very short; eyes hirsute; three ocelli. Prothorax somewhat rounded anteriorly, not strongly quadrate, Abdomen sessile; ovipositor originating from the middle of the venter, lying in a groove, its point extending a very little beyond the tip of the abdomen; from each side of the penultimate segment projects a fine hair, which furcates near its origin and extends but little beyond the tip, forming a minute peculiar appendage the office of which it is difficult to conjecture. Surface of the wings beset with bristly points and fringed around the greater part of their margin, the fringe or cilia on the hind wings very long; sub-costal vein consolidated with the costa, except its basal third, and extending half the length of the wing, and then deflected so as to form a very short stigmatic branch or stump. Legs simple, all the tibiæ spurred at their extremities, spurs on middle legs longest, spurs on anterior tibiæ a little incurved; tarsi five-jointed.

SPECIFIC DESCRIPTION — *Aphelinns mytilaspidis*, n. sp. —Length one twenty-fifth of an inch, some individuals (if the same species) do not exceed one thirtieth. Pale lemon yellow; mandibles reddish-brown; ocelli coral red; ovipositor reddish; a vacancy in the punctuation of the anterior wings, forming a narrow space or pathway across the basal half, extending inwards obliquely backwards from the stigma; cilia on the posterior margin of the hind wings longer than half the width of the wing. In the smaller individuals the fringe on both wings is proportionally longer, that on the hind wings being fully as long as the width of the wing. These may possibly be a distinct species.

then known, and mentions the frequent occurrence of these round holes in the scales at that time. He also discovered under some of the scales a little oval, footless maggot, which he conjectured might be the larva of some Hymenopterous parasite, which, in its exit, made the holes in question.

In 1867, Mr. Walsh, in his history of the Bark-louse, in his first annual report upon the noxious insects of Illinois, refers to Dr. Fitch's statement, and adds that he had often noticed the round holes in the scales, which he also attributes to the exit of a parasitic insect belonging to the Chalcis or Proctotrupes family. But he says he had never met with the larva described by Dr. Fitch.

In the course of a series of observations upon the Apple-tree Bark-louse, during the past season it has been my good fortune to trace the history of this interesting little insect, which, if it has ever been seen before, has not been identified, and whose very existence has been only a matter of inference from the visible marks of its beneficent operations.

In the early part of the season, whilst examining the lice upon an apple tree, I noticed two or three little yellow Chalcides running along the infested twigs, which I conjectured might be the parasites of the Bark-louse, but had no proof that this was the case. But about the first of August, upon raising one of the scales, I happened to uncover one of these insects in the last stage of its transformation. Its wings were not yet unfolded, but it ran so rapidly that I had some difficulty in keeping it within the field of the lens. As soon as it paused long enough to be examined, it was easily recognized as a Chalcis by its general aspect, and especially by the peculiar vibratile motion of its short geniculate antennæ.

Having once become familiar with its appearance, I have had no difficulty in capturing, in the latter part of August and September, all the specimens I desired on the infested trees. I have repeatedly watched the female Chalcis in the act of inserting her ovipositor through the scale of the Bark-louse, for the purpose of depositing her egg in the cell beneath. She always places herself transversely with respect to the scale. Sometimes she mounts upon it, and then her tiny body is seen to be considerably less in length than the width of the scale. Usually she backs up upon it only so far as to bring the tip of her abdomen about opposite the middle of the scale. Then bringing her ovipositor down perpendicular to her body, she forces it through the scale by a series of boring or short plunging motions. Having accomplished this she remains stationary for many minutes, whilst by some invisible intestine motion the egg is carried down the ovipositor and deposited beneath the scales. So absorbed is she in this delicate operation, upon the successful accomplishment of which not only her own hopes, but those of the horticulturist, so largely depend, that nothing can deter her from it. In one instance, having drawn down a branch of an apple tree, I discovered a *Chalcis* in the act of depositing. Whilst holding the branch in one hand, and viewing the insect through a lens held in the other, the branch slipped through my fingers and flew back with violence to its place. Drawing it down again, the twig I had hold of broke, and it flew back a second time. I supposed that that observation had, of course, been brought to an abrupt termination. But, upon drawing down the limb the third time, there stood my little *Chalcis* as immovable as a statue at her post. She may be touched with the finger whilst thus engaged, or even crushed, as I have often inadvertently done in my attempts to capture her, but nothing short of this actual violence can move her from her position. With such wonderful perseverance and devotion do these living atoms of creation perform their allotted part in the complicated economy of nature.

The egg thus deposited hatches into the little footless larva previously mentioned. This larva is so admirably described by Dr. Fitch, in a single sentence, that I can not do better than copy his description: "Under these scales I have repeatedly met with a small maggot, three-hundredths of an inch long, or frequently much smaller, of a broad oval form, rounded at one end and tapering to an acute point at the other, soft, of a honey-yellow color, slightly translucent and shining, with an opaque brownish cloud in the middle, produced by alimentary matter in the viscera, and divided into segments by faintly impressed transverse lines." (See Fig. 220, *c.*)

The only motion of which this small grub is capable is a slight extension and contraction of its body, particularly at the two extremities, by which its form is correspondingly modified.

There is usually but one larva under each scale, and I have never seen more than two. In the earlier part of the season it is seen adhering to the body of the Bark-louse, but later it is found in the midst of the eggs or their remains.

Whether there is more than one brood of this parasitic fly in a year, I have not yet been able to determine. At the time I am now writing—the last of September—we find numerous instances of the round holes, which must have given exit to an early brood of flies, and we also find under many scales larvæ most of which are nearly or quite fully grown, which must have proceeded from eggs laid by the early brood. Now, whether these larvæ will complete their transformations before winter sets in, and lay their eggs for the spring brood, or whether they will remain in the larva or pupa state through the winter, and come out in the winged form in the spring, are points which I have not yet settled, but which can be determined in the course of the next two months.

The Chalcis fly itself is a beautiful object under the microscope. Its length is a little less than half a line, or about one-twenty-fifth of an inch, though I have captured a few specimens considerably smaller, being but little more than one-third of a line. I at first supposed that these smaller individuals were males, but all the specimens that I have examined have proved to be females. Their color is a uniform pale lemon yellow. The only variation from this color is in the minute mandibles, which are reddish brown. There are three coral red occelli on the summit of the head, and the ovipositor, which lies in a groove on the underside of the abdomen, exhibits a slight reddish tint. The wings are thickly beset, over nearly their whole surface, with bristly points, and their margin is ornamented with a long fringe.

But a better idea of the appearance of this little insect will be obtained from the magnified figures which accompany this article than from any verbal description. (Fig. 220, *a.*)

What proportion of the destruction of the Bark-louse is due to each of the agencies above enumerated could only be determined by an extensive series of observations. It would probably be found to vary considerably in different sections of the country, and perhaps also at different periods. In my own locality, actual observation shows that, at the present time, the larvæ of the Chalcis are destroying more than twice as many Bark-lice as all other agencies together. As an illustration of this I have, whilst writing this page, taken four twigs infested with this year's lice, from four different apple-trees in two gardens remote from each other, and carefully examined the scales upon them, with the following result:

Whole number of scales....................	330
Round holes made by the Chalcis fly.......	116
Larvæ of Chalcis, under the scales..........	95
Ragged holes made by Coccinellæ..........	7
Shrunken and discolored eggs.............	81
Acari found under the scales..............	4
Scales containing eggs not damaged........	27

If we take this observation as a test, it appears that less than one-twelfth of the scales contain sound eggs for next year's crop, and even these have two fall and three spring months to pass through before the time of hatching. It also appears, as stated above, that more than twice as many lice are destroyed by the Chalcis (putting, of course, the second and third of the above items together) than by all other causes combined. The discolored eggs may have been destroyed by Acari.

If anything like this degree of fatality attends this insect in other parts of the country, it is evident that the career of the notorious Apple-tree Bark-louse is rapidly approaching its termination. Already the smoother bark, the greener foliage, and the fairer fruit, proclaim to the orchardist that this deadly insect is loosening its hold upon the apple tree; and many, no doubt, have prided themselves upon the successful application of some infallible wash, or patent nostrum; but underneath all this goodly show, busily intent upon the accomplishment of her own curious economy, and heedless of the momentous results she is effecting in human interests, works unseen our infinitesimal friend, the Apple-tree Bark-louse parasite (*Chalcis* [*Aphelinus*] *mytilaspidis*).

GENEVA, Ills., Oct. 1st, 1870.

NOTE.—By observations, made as late as the first week in November, the opinion is confirmed that the Chalcis of the Bark-louse has two broods in a year. By the middle of September we find many of this year's scales pierced with the round holes through which the first brood of Chalcides has escaped; and late in the fall we find, under about an equal number of scales, the fully-grown larvæ of the second brood, sometimes with the eggs of the Bark-louse upon which they have subsisted all consumed, and sometimes with a few remaining; and in this state they undoubtedly pass the winter. This second brood must appear in the winged form early enough next summer to deposit the eggs from which the first brood of next year will proceed.

I will take this opportunity to add that, since writing the above article, I have examined a large number of Bark-louse scales, collected from different localities in Kane and DuPage counties, with the following result:

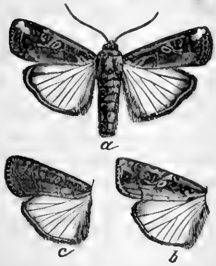
Whole number of scales examined.........	824
Number destroyed by Chalcides............	533
Destroyed by Acari and unknown causes...	234
Scales containing more or less eggs.........	57

From which it appears that more than twice as many Bark-lice have been destroyed by Chalcides than by all other causes combined, and that only about one scale in fifteen contains any eggs from which to perpetuate the breed of Bark-lice for another year.

THE FALL ARMY-WORM.

Prodenia autumnalis, n. sp.

[Fig. 221.]

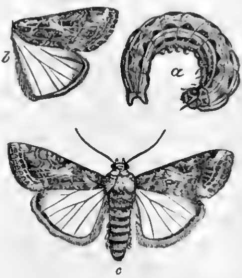


Colors—(*a*) Mouse-gray, brown, fulvous and white; (*b*) dark grayish-brown; (*c*) more fulvous.

We herewith present figures of the moth of the Fall Army-worm, of which worm we gave a brief account in the last number, and which has attracted such general attention this fall in many parts of Kansas, Illinois and Missouri. We have already shown how easily this worm may be distinguished from the true Army-worm, to which it bears a slight resemblance; and, by comparing the above Figure 221, *a*, with that of the true Army-worm moth (Fig. 223) the two insects will be found to differ still more widely in the perfect state.

Our Fall Army-worm moth is a most variable one—so variable, indeed, that at least three species might easily be fabricated by any species-grinder who happened to capture at large the three most distinct varieties, without knowing anything of their transformations. We have bred 31 specimens, all from larvæ found on corn, and have others which were captured at large, and though half a dozen sufficiently distinct varieties might easily be picked out from among them, and though scarcely any two are precisely alike, yet they may all be divided into three distinct sets or varieties. The first of these, which is the more common, is represented at Figure 221, *a*, the second at *b*, and the third at *c*. For those who are more curious in such matters we append, at the end of this article, a more elaborate description of this new moth. Not only do we find this great variation in this particular species, but all the species of the genus to which it belongs are variable; and Guenée has truly remarked that they resemble each other so closely, and their modifications are so complicated, that it is next to impossible to properly separate them. We have in this country a very common moth (*Prodenia commelinæ*, Abb.) which may be popularly called the Spiderwort Owlet moth, some of the varieties of which approach so nearly to some of the more strongly marked varieties of our Fall Army-worm moth that it is necessary to show the very great difference which really exists between them, in order that the cultivator may not be unnecessarily alarmed when he observes the former, by confounding it with the latter, and erroneously inferring that he will be overrun with Fall Army-worms when there is no real danger. The Spiderwort Owlet moth, which we herewith illustrate (Fig.222) is a handsomer and more distinctly marked species, the front wings inclining more to vinous-gray, or purplish-gray, and the ordinary lines being more clearly defined by very deep brown, than in the Fall Army-worm moth. But, however much these characters may vary—and they are quite variable—there are yet two others which will be readily noticed upon comparing the figures of the two species, and by which the Spiderwort moth may always be distinguished from its close ally, namely, by the tip of the wing being more prolonged and acuminate, and by the three-forked nerve in the middle of the wing being much more conspicuous. Its larva never congregates in multitudes as does the Fall Army-worm, and differs so materially from that worm, and is withal so characteristically marked, that it may be recognized at once by our illustration (Fig. 222, *a*). Contrary to what its name would indicate it is a very general feeder, as we have found it on all sorts of succulent plants, both wild and cultivated. This insect is more or less numerous every year, but has never been known to multiply so prodigiously as the Fall Army-worm, which we have under consideration.

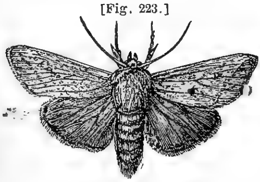
[Fig. 222.]



Colors—(*a*) vinous-brown, velvety-black and yellow; (*b* and *c*) gray, deep brown, white and fulvous.

Now that we have sufficiently dwelt on the characteristics of the Fall Army-worm to enable any one to distinguish it, even from its nearest relative, let us consider for a moment what can be done to prevent its great injuries to grains and to vegetables. We have proved that there are at least two, and probably as many as three or even four, broods during the course of the year; for those worms which appeared in such multitudes in August and the forepart of September, in due time produced moths, and these gave birth to a new generation of worms, which began to make their presence manifest towards the end of October. And it will be remembered that, as stated in our last number, we bred the moth as early as July, in 1868, from worms received from Mr. Daggy. In this prolificacy our insect differs remarkably from the true Army-worm, as well as from most of its close allies, which generally produce but one, and seldom more than two, broods each year.

[Fig. 223.]



Colors—Light-red, dark-brown, white and dusky.

The moths were so numerous during the latter part of September and the forepart of October, that we not only found them common at Decatur, Vandalia and other parts of Central Illinois, and wherever we traveled in Missouri, but we captured a goodly number in the very heart of the city of St. Louis, and even caught some while riding by rail.

The eggs are deposited in small clusters, often in two or three layers one above the other, and the whole cluster is covered sparsely with the yellowish hairs from the ♀ abdomen. Each egg is nearly spherical, of a pale fulvous color, and differs only from that of the Unarmed Rustic (*Agrotis inermis*), which we illustrated on page 188 of our first volume, in being less compressed and less distinctly ribbed. The clusters were found abundantly, not only on the underside of peach and apple leaves, which the worms readily devour, but on the leaves of such trees as sycamore, which, so far as we at present know, they do not feed upon. Under these last circumstances the young worms, upon hatching, would soon descend the tree to feed upon the more succulent herbage below; and the more we learn of the habits of our different Owlet moths, the more we become convinced that the long-accepted theory of their eggs being deposited on the ground is a false one, and that most of our cut-worms, though fat, lazy and groveling in the ground when we find them, have been born in more elevated and exalted positions.

In the fall of 1868 this worm proved very destructive to the newly sown wheat in many parts of Franklin and St. Louis counties, Mo., and seemed to be confined to such wheat as was sown on oats stubble. We then accounted for this singular state of things by supposing that the scattering oats which were left after harvest had sprouted before the wheat, and had thus attracted the parent moths;* and, acting upon this supposition, we suggested that the attacks of the worm might effectually be prevented by ploughing the land early and keeping the ground clear of all vegetation until the wheat was planted. This inference proves to be well warranted by the facts; and in future, when the Fall Army-worm is heard of during the months of August or September, as it was the present year, it will be wise for those who live in the immediate neighborhood, either to sow no fall grain at all, or to endeavor, in doing so, to carry out the above suggestions. The last brood of worms, which at this writing (Nov. 7th) are not yet quite full grown, must evidently pass the winter in the ground, either in the larva or the pupa state. In either case a great many of them would be killed by late fall plowing, which should be used, when practicable, as a remedial measure in fields where this insect has been numerous. When the worms are overrunning a field of fall grain, most of them could be destroyed by means of a heavy roller, without injury to the grain.

The question has been repeatedly asked: "Will this worm be as numerous next year as it has been this; or will it go on increasing in geometrical ratio, and be still more numerous?" Now, although we greatly dislike to weaken the confidence that some people seem to place in the oracular power of entomologists to peer into the future, yet we must meekly confess our inability to give any definite answer to such questions.

Byron has truly said that, "the best of Prophets of the future is the Past;" and we may reasonably draw the inference that this worm will *not* be so abundant next year, because in the past it has only occasionally been so troublesome, and never to our knowledge during two consecutive years. And we can with tolerable assurance say that it will not increase in geometrical ratio, because it was extensively preyed upon this fall by a *Tachina* parasite, and because such continued increase of one species is inconsistent with the harmony we find everywhere in Nature. But we cannot venture beyond the inference, as the happenings of the future are not for mortals to know. Some persons may also be curious to learn why this worm increases so much more in late summer and fall than in spring, since there are so many broods during the year; or why it

* Missouri Ent. Rep. I, p. 88.

is only noticed in certain years? Such questions, likewise, can receive no definite answer,

> "Till old experience do attain
> To something like prophetic strain."

For though, to meet the first, we may assume that the winter decimates their numbers, or that the spring weather is not favorable to their increase; and to meet the last we may conjure up a hundred reasons—yet assuming is not knowing, and we must content ourselves with the facts as they occur.

In conclusion, it will afford a grain of comfort to those who have had wheat fields cleaned off by this worm, to know that their wheat is not necessarily ruined; for, as we personally ascertained, wheat that had been thus cut off in the fall of 1868 made a good stand the following spring; and in one instance, where part of a field had been invaded and the rest left untouched, it really appeared that the part which had been eaten off yielded the heaviest. Mr. Huron Burt, of Callaway county, Mo., also informs us that this insect always leaves blue-grass untouched.

Prodenia autumnalis, n. sp.—*Imago* (Fig. 221, *a*, *b* and *c*). *Front wings* narrow with the apex usually well rounded, and with the middle of the hind margin sometimes, but not often, extending beyond apex: general color mouse-gray variegated with smoky-brown, fulvous and pearly or bluish-white, apical patch, bluish-white and never extending beyond nerve 5: the subterminal line—which is pale and bends like a bow, approaching nearest the terminal line between nerves 3 and 4—generally blends with this patch so as to appear to start from its lower edge, but is sometimes well separated from it so as to be traced further towards apex: dark space preceding subterminal line, confined between nerves 3 and 5, blending gradually with the rest of the wing, and barely showing two darker sagittate spots: transverse anterior and transverse posterior either subobsolete or tolerably well defined, each by a geminate dark line: basal area divided longitudinally by an irregular dark line, the wing below it quite light-colored: orbicular spot large and elongated, a little lighter than surrounding surface, and well defined by a fulvous annulation, the pale oblique shade which generally encloses it in this genus confined to a fulvous shade above, and either a more distinct fulvous line behind or none at all: reniform spot generally dark, but sometimes lighter than space preceding; not well defined, the small pale spot at top being generally distinct, and either partaking of the same form, or resembling the small letter e [left wing]; the lower edge occupied by a distinct white dash, which however never extends beyond it and but seldom shows any tendency to furcate with the nerves: four tolerably distinct equidistant pale costal spots from reniform spot to apical patch: terminal line pale, even, parallel with posterior margin: terminal space dark, except near apex and anal angle, divided into subquadrate spots by the pale nerves: fringe either broad or narrow, of same color as wing, with a narrow darker inner line, relieved by two very fine paler ones which are barely distinguishable: under surface smoky, but paler interiorly and terminally, and fulvous along costa; the whole with a nacreous lustre and more or less irrorate with brown, and often with a flesh-colored tint near apex; fringes dark. *Hind wings* white with a faint fulvous tint; semitransparent and slightly iridescent, with extremities of nerves and borders, especially above, brown; fringes dusky, especially at apex, and with a paler inner line; under surface similar. Thorax, abdomen and legs of same general color as front wings, being paler below; the longer lateral and anal abdominal hairs more fulvous. Sexes with difficulty distinguished, the size and shape of the abdomen not even being a safe criterion. Maximum expanse 1.40; minimum expanse 1.05 inches. Described from 18 specimens, bred Sept. 20th—Oct. 10th, from corn-fed larvæ.

VARIETY FULVOSA (Fig. 221, *b*).—*Front wings* greatly suffused with fulvous, especially in the lower median space, which often inclines to ochraceous; apical space more or less defined; oblique median band distinct to median nerve, and orbicular spot with an ochre-colored centre. Described from 5 specimens, bred Sept. 25th—Oct. 3rd, from corn-fed larvæ.

VARIETY OBSCURA (Fig. 221, *c*).—*Front wings* of a much more uniform and darker color, either grayish-brown with a slight vinous tint, or deep smoky brown inclining to black, or a deep warm brown with but little gray; apical space either entirely obsolete or but very faintly indicated; oblique fulvous band across upper middle of wing also obsolete; the ordinary lines either entirely obsolete [one specimen only] or distinctly marked; the ordinary spots sometimes obsolete, but more generally indicated by fulvous lines. Described from 8 specimens, bred Sept. 21st—Oct. 2nd, from corn-fed larvæ.

Larva.—Ground color very variable, generally dark and pitchy-black when young, but varying after the last moult from pale brown to pale dirty green, with more or less pink or yellow admixed—all the markings produced by fine, more or less intense, brown, crimson and yellow mottlings. Dorsum brownish with a narrow line down the middle, rendered conspicuous by a darker shade each side of it. A dark, subdorsal band ½ as wide as each joint is long; darkest at its upper edge, where it is bordered and distinctly separated from dorsum by a yellow line which, except on joint 11 where it deflects a little upwards, is quite straight; paler in the middle of each joint. A pale, either buff or flesh-colored, substigmatal band, bordered above and below by a narrow, yellow and wavy line. Venter pale. Head pale yellowish-brown, with sometimes a tinge of green or pink; the triangular piece yellowish, the Y-mark distinct and white, the cheeks with four more or less distinct lateral brown lines and with dark brown mottlings and nettings, which become confluent and form a dark curved mark at the submargin behind the prongs and each side of the stem of the Y. Stigmata large, brown, with a pale annulation, and just within the lower edge of the dark subdorsal band. Legs either light or dark. Cervical shield darker than body, with the narrow dorsal and subdorsal lines extending conspicuously through it: anal plate also dark, narrow and margined by the pale subdorsal lines—both plates furnishing stiff hairs, but without tubercles. Piliferous tubercles on joints 2 and 3, arranged in a transverse row, and quite large, especially on joint 2; on joints 4—10 inclusive the superior eight are arranged as follows: 4 in a trapezoid in dorsal space, the posterior two as far again from each other as the anterior two, and two near stigmata, one above and one behind: on joint 11 the dorsal 4 are in a square, and on joint 12 in a trapezoid, with the posterior and not the anterior ones nearest together: the thoracic joints have each a large subventral tubercle just above the legs. Length 1.10—1.50 inch. Described from numerous specimens.

Pupa.—Formed in ground, without cocoon; of normal form, bright mahogany-brown, and with a distinct forked point at extremity.

THE SO-CALLED WEB-WORM OF YOUNG TROUT.

So much has already been written about the *Simulium* by those who are much better versed in the science of Entomology than I am, that I feel like treading on sanctified ground in undertaking to write concerning it. But as I was successful in rearing the perfect insect of the particular species that makes Spring Creek its home, and has lately caused such a commotion among the followers of the "gentle art," I will endeavor to give my observations and experience in as few words as possible.

They made their first appearance in the perfect state about the first of April. At that time I had two larvæ. One of them perished in a few hours after leaving the water. The other spun what might be called a fine delicate "web," closely welding it to the glass at every point. This structure was irregular in outline, but if a circle were inscribed in it, the radius of the circle would correspond to the length of the grub.

By pouring some fresh water into the dish, the larva was displaced. It could not regain its former position, nor did it make another endeavor to spin; but died in a day or two. During the months of April and May, while searching for other aquatic larvæ, I occasionally found a few sickly attenuated looking ones adhering to stones in the bottom of the creek. About the first of June I found immense numbers, both of larvæ and pupæ, attached to water plants that were three or four inches below the surface of the water.

I also found them on different occasions in vast quantities in several similar situations. A great many were displaced by a heavy rain storm, and carried on by the current of the stream, until they found a resting place on sunken boards and stones. The natural position of the larvæ in the stream is a few inches below the surface of the water and in the current of the stream. Here the "wonderful instinct" of the parent is exemplified; for if these larvæ were near the bank, or where the temperature of the stream varies, they would immediately perish. Before they were disturbed they were all attached to decaying vegetation, principally water-cress. Some were on forest leaves of last year's growth that had become entangled among the water-cress. These leaves were of a brown color, and the larvæ on them were the same color, while those on the leaves and stalks of the water-cress were a murky green. But when found on stones or kept in a glass dish of clear water for a time they are almost transparent. The markings of black on the segments being well defined. On account of the difference in color I inferred that they derived their nourishment from the vegetation, and while it was in a state of decomposition.

When frightened they drop into the water, suspended to the substance to which they had been attached by means of a fine delicate thread, in a similar manner to many land larvæ. They can ascend this thread, but it is very easily broken by the action of the water and washed away.

The pupæ, as well as larvæ, perish in water of a temperature warmer than that of the stream. From this, we may infer, that this particular species will only be found at spring-heads where the water remains of an even temperature.

I was enabled to obtain the perfect insect by keeping pupæ in a covered box in the current of the stream. A day or two previous to emerging from the water, the pupa loosens itself from the case or "pouch" by a gentle wriggling motion from side to side. When it becomes free it rises to the surface of the water, and the fly gradually draws itself out of a slit the entire length of the pupa. The legs are the last to appear. The fly rests on the surface of the water until its wings expand and dry. This process usually takes a minute of time—sometimes more or less. They leave the water just before sunset, and will then be found flying among low herbage near the bank of the stream. In creeping over my hands they caused a disagreeable tickling sensation, apparently deriving their nourishment in the same manner as the common House-fly.

There were a few larvæ marked with red on the segments instead of the usual black. The same red showed on the wings of the pupa and in circular bands on the body and legs of the imago. The larva spins, what has thus far been called the "web;" in the center of this it then, by working with its head bent backward over its body, finishes the pouch. The feathery ornaments on the head of the larvæ seem to change during the transformation into the filaments of the pupæ; the puparium being formed at the same time by the contraction of the larva skin.

There have been a succession of broods this summer. During the warm season, a period of two months elapsed between the egg and perfect forms. They were a week or ten days as eggs, four weeks as larvæ, and about three weeks as pupæ. These flies were much smaller than those that appeared late in the season and early in the spring, although there was apparently no difference in the size of the larvæ and pupæ. At the present time, (Oct. 18th) there are large quantities of minute larvæ on the leaves of the water-cress.

How or in what manner this larvæ has come to be designated as a "*web worm*," is more than I can determine, as it spins no web either for its own protection or for the destruction of any living thing. There is only the single filament that suspends it in the water when disturbed, and the moorings of the pupa pouch. These are all it ever spins. The only way it can interfere with young trout is by supplying them with a large amount of very palatable food.

The following is quoted from *Wilkes' Spirit of the Times*, (June 18) where this larvæ is called a *submarine spider*, and by a *great naturalist:*

"The ponds are owned by Mr. Myron Pardee, a very wealthy gentleman of Oswego, who propagates trout for his amusement and scientific purposes, he being a great naturalist. We are informed that it is to Mr. Pardee that Seth Green is indebted for the discovery of the submarine spider and its web, so fatal to young trout."

SARA J. MCBRIDE.

MUMFORD, N, Y., Oct. 19th, 1870.

[We really hope that those who have the opportunity will sift this matter to the bottom, and ascertain whether or not this *Simulium* is injurious in the larva state, by killing the young trout, or beneficial, by furnishing said trout with desirable food. The settlement of the question must deeply interest fish-growers, and the New York fish commissioners should by all means cause the proper investigations to be made. It is conceded that the larva can spin a web at any time of its life, and we confess that Mr. Green's conclusions seem quite plausible. Yet our fair correspondent is of a different opinion, believing the whole thing to be a "fish story;" and we may add here that Mr. Fred. Mather, of Honeoye Falls, N. Y., is of her opinion, for he wrote to us last July—"I do not believe they [the worms] ever killed a dozen young trout since the Creation." According to our promise we subjoin a description of the species.

Simulium piscicidium, n. sp.—♀ *Head* velvety black; eyes brownish; antennæ with joints 1, 2, 3 and 11 subequal in length, each of the others half as long, 1 and 2 rufous, 3—11 inclusive, black and gradually diminishing in thickness to the last, which is fusiform; palpi longer than antennæ, black. *Thorax* velvety black with faint fulvous pubescence above; halteres opaque and white. *Abdomen* 9-jointed, joints subequal in length, except the last two which are smaller and smaller; dorsally velvety black, laterally and ventrally, especially towards base and at incisures, inclining more or less to rufous. *Legs* with the front trochanters white, or fulvous, and the middle and hind ones more dusky; the coxæ all either rufous or fulvous; the femora all dark, though sometimes [2 specimens] the base is paler; front tibiæ with the upper three-fourths white, the rest black; middle tibiæ with the upper two-thirds white, the rest black; hind tibiæ with about the upper one-half white, the rest black; front tarsi black; middle and hind tarsi with the upper half of first joint white, or rufous, the rest black. *Wings* sub-hyaline with the veins fuliginous. Length of body [alcoholic specimens], 0.14—0.17 inch.

Described from six specimens bred by Sara J. McBride from the larva illustrated at Figure 143. When fresh the lighter parts of the abdomen are often blood-red or dull-red. We have but small means of ascertaining whether this species is really described, or wherein it differs from our other described species. It differs notably from *S. reptans*, Linn., and from *S. venustum*, Say. *S. calceatum*, Harris, is apparently a catalogue name, and cannot be identified, except by comparison with the type, which may not now exist. Of *S. decorum*, Walk., *S. invenustum*, Walk., and *S. vittatum*, Zett., we have no descriptions at hand. Our specimens, which seem to be all ♀, are some of them in alcohol and some in glycerine. Those from the alcohol, upon drying, appear more grayish than those from glycerine, and no doubt the velvety appearance would give way to a brighter and more metallic lustre in the living and well matured specimens. But the coloration of the legs will at once distinguish the species.—Ed.]

Napoleon, at the summit of his prosperity, never inflicted more damage on a nation than the liliputian insect army annually inflicts on the United States.

On the Group Eurytomides of the Hymenopterous Family Chalcididæ:

WITH REMARKS ON THE THEORY OF SPECIES, AND A DESCRIPTION OF ANTIGASTER, A NEW AND VERY ANOMALOUS GENUS OF CHALCIDIDÆ.

BY BENJ. D. WALSH, M.A.

[*Concluded.*]

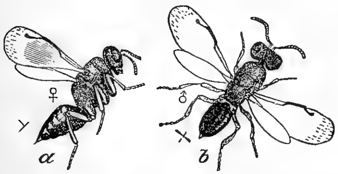
SUBFAMILY PTEROMALIDES, Westw

Genus Semiotellus, Westw.—The species now to be described is parasitic upon *Isosoma hordei* (the Joint-worm Fly), Harris, and is congeneric with the celebrated parasite of the Hessian Fly (*Cecidomyia destructor*, Say), which was specifically named *destructor* by Say in the year 1821. To illustrate the general uncertainty and obscurity as to the correct classification of the *Chalcis* flies, it may be stated here that Say originally referred this species to the genus *Ceraphron*, which does not even belong to the *Chalcis* family, but to the closely allied *Proctotrypes* family. Westwood, writing in 1840 and judging from Say's figures and descriptions alone, declared that it must be "evidently one of the *Eulophides*," the 5th subfamily of *Chalcididæ* (*Introd* II, p. 160); though, according to Curtis, he subsequently changed his opinion, and thought that "it might possibly be a *Pteromalus*," a genus belonging to the 3rd subfamily of *Chalcididæ* (Curtis's *Farm Insects*, p. 260). Dr. Harris, in 1841, being led into this error by a letter of Herrich's, dated Jan. 24, 1840 (see *Harris Correspondence*, p. 195), referred it to the genus *Eurytoma*, which belongs to the 2nd subfamily of *Chalcididæ;* and for a long time the insect was currently known by Dr. Fitch and others as *Eurytoma destructor*, Say. At length in 1852 Dr. Harris, perceiving that the insect differed altogether from true *Eurytoma*, referred it doubtingly to *Rhaphitelus*, a genus of the 3rd subfamily of *Chalcididæ*. In my Essay on *Illinois Insects*, published in 1864, in the *Trans. Ill. St. Agr. Society* (IV, p. 370), not having then seen the second edition of Harris's book on *Injurious Insects*, in which Harris's last generic determination was announced, as his first determination had been announced in the first edition of the same work, which I had long previously seen, I doubtingly referred this and two closely allied species to *Glyphe*, a genus belonging to precisely the same sub-group of the 3rd subfamily of *Chalcididæ* as *Rhaphitelus*. Finally, Dr. Fitch, writing in the same year, 1861, as myself, transferred this unfortunate wanderer to a genus—*Semiotellus*—belonging to a different but allied sub-group of the same 3rd subfamily of *Chalcididæ*. Thus we see that one and the same insect has at different times, and by different authors, been classified in two different families—*Proctotrypidæ* and *Chalcididæ*—and in no less than three different subfamilies of the latter family, namely the 2nd, 3rd and 5th, and in as many as five different genera included in those three subfamilies, namely *Eurytoma*, *Pteromalus*, *Glyphe*, *Rhaphitelus* and *Semiotellus*.

For reasons given at the commencement of this paper, I do not feel disposed to dispute here the correctness of the generic nomenclature adopted by Dr. Fitch. I am satisfied, at all events, that I was wrong myself in referring the Hessian Fly parasite and its allies to *Glyphe*. As *facts* are always of far more scientific importance than *phrases*, I subjoin here the leading generic characters by which the genus—whatever name we may choose hereafter to give to it—may be distinguished.

Genus Semiotellus? West., Fitch. (Fig. 7).—Body short and stout. Head transverse, and much wider than the thorax. Antennæ ♂ ♀ 9-jointed (Sc.+7+Cl.), with the club acute at tip, much compressed and almost setiform, especially ♂, when viewed in one direction; antennæ ♂ filiform, the club as long as the two preceding joints put together, and in no point of view wider than they are; antennæ ♀ gradually thickened from the base nearly to the tip of the flagellum, the club not quite as long as the two preceding joints put together, and when viewed in one direction much wider than they are. Thorax as in Figure 8 *C*. Collar very short, transverse; parapsidal grooves obsolete behind. Abdomen when viewed from above, ♂ oval or sometimes almost obovate, ♀ ovate; when viewed in profile, ♂ elongate-oval or almost linear, ♀ triangular with the apex of the triangle downwards.

[Fig. 7.]



Semiotellus chalcidephagus, N. SP. ♀ (Fig. 7, *a*) —Blue-black or dark indigo-blue. *Head* finely and confluently punctured and scarcely polished. Antennæ pale rufous, darker towards the base, the flagellum not pubescent, and the flagellar joints indistinctly separated. *Thorax* sculptured as the head. *Abdomen* almost sessile, depressed, flattened above, rounded below, polished, with a few short whitish hairs towards the tip; color less blue than the head and thorax, and with coppery reflections especially below. *Legs* black, with the tibiæ and tarsi, except the tips of the latter, pale rufous, the tibiæ occasionally being basally clouded with black on the outside. *Wings* hyaline; front wing with a dark smoky cloud extending backwards from the subcostal vein, from where that vein first touches the costa to the tip of the ramus or branch, but not quite attaining the hind edge of the wing; veins brown, much paler towards the base of the wing. Length, ♀ 0.09—0.11 inch.

The ♂ (Fig. 7, *b*) differs as follows from the ♀: 1st, the antennæ are longer, with the flagellar joints pubescent and distinctly separated, joints 1 and 2 rufous, 3—9 dark brown; 2nd, the abdomen is subpetiolate, narrower, its tip acute, and with the penis often protruded, the coppery tinge stronger than in ♀; 3rd, the front wing has no dark smoky cloud. Length, ♂ 0.08—0.10 inch.

Described from 18 ♂ 15 ♀; namely, 17 ♂ bred from last year's barley galls June 11th—22nd, 1 ♂ sent to me by Mr. Pettit from Grimsby, C. W., 14 ♀ bred from last year's barley galls June 14th—28th, and 1 ♀ cut out Sept. 10th from barley galls of the same year's growth.

In but very few other insects, as in this species, does one sex have a distinct dark cloud on the wing and the other sex none at all. But in a European May-fly, *Potamanthus marginatus*, Zetterst., as I was informed long ago by Dr. Hagen, the ♂ has a dark patch on the front wing and the female has perfectly hyaline wings. In *Myodites Walshii*, Lec.—a beetle described from specimens furnished by myself—the converse rule holds good, for here the ♂ has perfectly hyaline wings and the ♀ has a large dark patch on her wings, as in the Chalcidian now treated of.

Larva of the above.—Length 0.13 inch, from 4½ to 5 times as long as wide, the body a little tapered towards the anus. Color a pale glaucous green, the head of a somewhat darker shade, as also joints 3—10 of the body. Jaws dark-colored, transversely arranged in repose, by which last character this larva may be distinguished at once from the Joint-worm upon which it preys, for the latter always has its jaws directed backwards in repose at an angle of about 45° with the axis of its body, instead of being directed sideways at an angle of 90° with the axis of its body. It differs also from the Joint-worm in the less reliable character of being greenish-white, instead of bright yellow.

Two distinct species of *Chalcis* flies were found by Harris and Fitch to be parasitic in Joint-worm wheat-galls received from Virginia, and very beiefly described by these authors: 1st, a *Torymus*, ♀ with an ovipositor nearly as long as her body, and 2nd, a *Pteromalus* (Harris' *Inj. Ins.*, pp. 556–7). This last differs from my species in having the antennæ black with the scape bright copper-color, in the femora being pale yellow, and in the tibiæ being blackish, besides other less obvious distinctions.

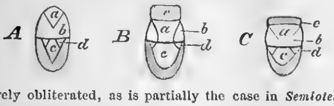
SUBFAMILY ENCYRTIDES, Westw.

ANTIGASTER, new genus —The new genus to which the following new species belongs is one of the most anomalous known to science. Many other genera are more or less contractile, *e. g.*, *Agathidium*, *Clambus*, *Leiodes* and *Sphæromorphus* in Coleoptera, and the genera *Eurytoma* and *Decatoma* and the different genera of *Chrysididæ*, in Hymenoptera. But all these, when they roll up in a more or less complete ball to protect themselves from their foes, roll up downwards with a convex back, whereas *Antigaster* rolls up upwards with a convex belly and sternum. In the only group of insects known to me that approximate to *Antigaster* in this peculiarity—*Staphylinidæ* in Coleoptera—the anus is curved up over their backs to adjust their wings under their very short elytra, and never, so far as I have been able to see, for protection against their enemies by the assumption of a contractile attitude. It is very true that certain species of these beetles, when approached in a threatening manner, curve the anus over their backs; but this appears to me to be simply analagous to a similar proceeding on the part of *Libellulidæ*, which when roughly handled generally curve the anus under the thorax, after the fashion followed by the ♂ *Libellulidæ* in copulation. In both these cases an attitude which is normally and habitually employed for entirely different purposes, is abnormally and occasionally adopted by way of a threat.

ANTIGASTER, n. gen.—♀ (Fig. 9) Body capable of rolling up the contrary way to a *Chrysis*. Antennæ as in Figure 9, *d*, 10-jointed (Sc.+8+Cl.), springing from near the lower internal corner of the eye, each antenna about twice as distant from the other one at its origin as it is from the eye; basal part of the scape much curved inwards; the flagellum gradually clavate from base to near the tip. No antennal groove. Prothorax but slightly attached to the thorax, very large, distinct, and prolonged upwards in a lateral more or less acute and curved hook, the tip of which is directed forwards. Mesothoracic scutum (Fig. 8, *A*, *b*) forming along with the hind angle of the præscutum (*a*) a square excavation adapted to receive the head in repose; scutum and præscutum closely united together, but connected only by loose membrane laterally with the pleura and behind with the scutellum (*c*) and postscutellum (*d*), so as to be capable of being elevated behind. The scutellum and postscutellum similarly capable of being elevated in front, in which case the mesonotum, when viewed in profile, lies in an angle of 80°: this is the position of repose. The same parts, when depressed for flight or walking, and viewed in profile, lie in a gentle curve forming a circular arc of only 30°, instead of an acute angle. Collare very short, and only visible when the mesonotal subsegments are depressed, its hind edge uniting with the triangular præscutum in a quadrant, the convexity of which is towards the head. Abdomen clavate, its upper surface flat or a little excavated, its lower surface rounded. Tarsi all 5-jointed, with the basal joint the longest. Front femora and tibiæ robust. Middle legs with their coxæ springing from the extreme hind end of the mesosternum, the two coxæ close together, the femur much depressed and with its inner edges perfectly straight, so that the two femora unite in as close and smooth a joint as do the elytra of most beetles, thus forming a broad plate to protect the lower surface of the abdomen in repose; tibial spur very long; first tarsal joint widely compressed and finely dentate below, and tarsal joints 2—5 unusually robust. Hind legs with their coxæ springing from the tip of the metathorax, but wide apart so as to admit the middle legs to pass between them in repose. When all the four hind coxæ are directed backwards, the tip of the middle coxæ reaches as far as the middle of the hind coxæ. Front wings with the subcostal vein uniting with the costa about half way to the tip of the wing; ramus or stigmal branch springing from the costa at an angle of 45°, straight, clavate, and fully one-sixth as long as the extreme breadth of the wing. Subcostal vein in the hind wing somewhat indistinct. The ♂ is unknown.

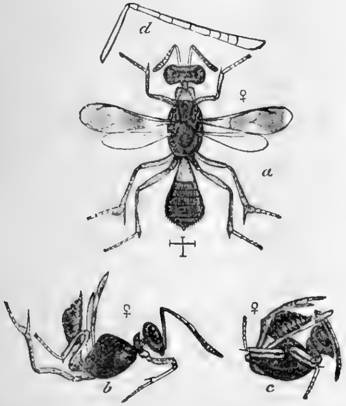
In the only other *Encyrtides* in my collection, namely 1 species belonging to a genus allied to *Cerapterocerus*, and 2 species belonging to a genus allied to *Coccophagus*, the collare, though short and transverse, is distinctly visible from above, and the sutures between the mesothoracic præscutum and scutum, commonly known as the parapsidal grooves, are

[Fig. 8.]



entirely obliterated, as is partially the case in *Semiotellus* (Fig. 8, *C*). Figure 8, *A*, shows the mesonotal subsegments of *Antigaster*, as seen from above when depressed for flight or walking. Figure 8, *B*, shows the corresponding parts in the mesonotum of *Eurytoma*, *Decatoma* and *Isosoma*; and Figure 8, *C*, those in *Semiotellus*. In all the three figures the collare (when visible) and the metathorax are shaded to distinguish them from the mesonotum; and in the mesonotum of all of them the præscutum is lettered *a*, the scutum *b*, the scutellum *c*, and the postscutellum *d*; the collare (when visible) being lettered *e*.

[Fig. 9]

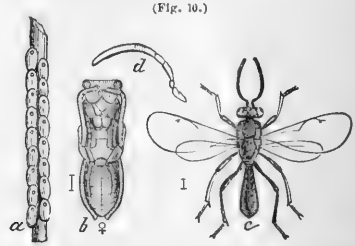


Antigaster mirabilis, N. SP.—♀ (Fig. 9, *a* back view, *b* curling up, *c* nearly curled up—both in profile) *Head* subopaque, finely and closely punctate; brilliant greenish-coppery with purple reflections. Mouth, including the clypeus, black. Antennæ with the joints rather indistinct; the scape half as long as the other joints put together, joints 2—10 proportioned as 3, 9, 4, 6, 6, 4, 4, 4, 9; the scape rufous, the other joints brown-black, those of the flagellum opaque. *Prothorax* rufous. *Thorax* above and on the pleura finely and shallowly rugoso-punctate and subpolished; the mesothoracic præscutum (Fig. 8, *A*, *a*) subopaque, equilaterally triangular, finely and closely punctate and of a more or less brilliant greenish coppery-color; the other thoracic pieces, black with blue and green reflections, except that the pleura is, sometimes, rufo-piceous on its disk. The sternum is polished, devoid of sculpture, and black with metallic green reflections. Membranous parts before and on each side of the scutel rufous. A bright blue plate in the form of a rectangular triangle on each side of the metathorax, the rectangle outwards and forwards. *Abdomen* black, subpolished, glabrous except a few short hairs towards its tip; basally slender and regularly widening, with its sides straight two-thirds of the way to the tip, thence regularly curved to the tip, which forms an obtuse angle Joint 1 fully ⅓ as long as the rest put together, and yellowish semi-transparent white, except its basal ¼, and except that the base of joint 2 shows black through the transparent overlap of the terminal edge of joint 1. Sheaths of ovipositor white. *Legs* rufous; hind coxæ dusky, especially above; the four hind femora and tibiæ a little clouded externally with dusky, and the last tarsal joint in all 6 legs dusky. *Front Wings* dusky shading into hyaline on their terminal 1-6; their basal ⅓ and a broad transverse widely interrupted band a little beyond the middle, both of them whitish subhyaline; veins and stigmatic branch brown. *Hind Wings* hyaline; veins pale brown. Length ♀ 0.13—0.14 inch.

Described from 3 ♀ taken upon herbage near Rock Island, Ills., in August and September; 2 ♀ with the thoracic parts elevated and the body more or less rolled up, the other ♀ with the thoracic parts depressed and the body extended; ♂ unknown. Nothing but the almost exact correspondence of all the complicated colorational and structural peculiarities, found in this insect, would ever induce any entomologist, unacquainted with this most remarkable genus, to believe that these three specimens are all identically the same.

ROCK ISLAND, Ills., March 22, 1869.

(Fig. 10.)



[To make this paper as complete as possible, we subjoin a few remarks on the natural history of *Antigaster mirabilis* and a description of the ♂. In doing so we cannot repress a sigh of regret that so cruel a fatality should have prevented the master hand which penned the Paper from properly completing it.

During the month of April, 1869, we bred 9 ♀ 5 ♂ of this parasite from one batch of eggs of *Phylloptera oblongifolia*, DeGeer, found near St. Louis; and 3 ♀ from another batch received from Louisiana, Mo.—thus indicating that it is by no means of uncommon occurrence in these eggs. As Mr. Walsh's three ♀♀ were all captured during August and September, we must infer that this parasite is either double-brooded, or that it (the ♀ at least) survives during the summer months from April to September. The last hypothesis is doubtless the correct one, for if it is double-brooded it must breed in some other kind of eggs than those of *P. oblongifolia*, which are not deposited in the latitude of St. Louis till the first of September, and which hatch during the fore part of April.

The larva of this little anomaly we have never seen, but the pupa (Fig. 10, *b*) is characteristically flattened and straightened so as the better to adapt it to its compressed domicile. The fly, after it is full fledged and well dried, gnaws an irregular but usually round hole near one end of the egg, through which to escape to the light of day; the eggs which have been parasitized thus presenting the appearance of Figure 10, *a*.

The sexes differ remarkably, and had we not bred both sexes from the same batch of eggs we should scarcely have believed them to be at all allied. The ♂ (Fig. 10, *c*) will be best described by comparison with the ♀. As will be seen by glancing at the figures of the two sexes, he approaches much more nearly than she does to the normal Chalcididous form. We believe it is a very general law in *Chalcididæ*, that where the ♀ is greenish the ♂ is always of a more brilliant and decided green, and our ♂ *Antigaster* forms no exception, being of a much brighter metallic green than the ♀. We never saw him roll up backwards as does the ♀, and, from his form, do not believe that he has this peculiar power. He certainly has not that remarkable and unprecedented power, which she possesses, of setting up or depressing at will the mesonotal subsegments; and he differs in other respects as follows:

Antigaster mirabilis, ♂.—Color brilliant metallic-green with faint blue and purple reflections. *Head* very bright green, finely and closely punctate; eyes pale with a dusky patch in front, smaller and further apart than in ♀; eylets purplish: antennæ black and opaque throughout, cylindrical, of a more uniform thickness and proportionally rather longer than in ♀, reaching, if turned back, to the base of abdomen, whereas those of ♀ scarcely reach so far; 10-jointed, the joints proportioned as 3 (scape), 1, 3, 2, 2, 1·10, 1·10, 1·10, 1·10, 8 (club). Collare very short. *Thorax* above very finely punctate and subpolished, and either bright metallic-green or coppery-green with faint purple reflections, the metathorax more bluish and more highly polished than the rest; built on a different plan from that of ♀; lacking the very prominent and characteristic prothorax, the præscutal triangular piece, and the square excavation, which occur in that sex, and more nearly resembling *Eurytoma*, *Decatoma*, etc (Fig. 8, *B*), in the divisions of the mesonotom. *Abdomen* dark metallic blue throughout, glabrous, smaller and more uniform in diameter than in ♀, the joints distinguished with difficulty but apparently proportioned as in ♀. *Legs* with the femora all dusky with a faint bluish reflection; trochanters rufous; coxæ steel-blue; front and middle tibiæ white; hind tibiæ dusky; tarsi all white, with occasionally (1 specimen) the terminal joint dusky, the middle pair lacking in a great measure the peculiar enlargement of basal joint. *Wings* more rounded than in ♀, perfectly hyaline, the stigmatic branch but faintly discernable. Length 0.09–0.10.

Described from 3 dried specimens.—ED.]

A NEW ROVE-BEETLE: PARASITIC ON THE CABBAGE MAGGOT.

In my communication which appeared in your last number (page 302), on the Parasitic Rove-beetle, I am made to say what I did not intend. In the second column, line 33 from top, it should read "*and* one pupa," instead of "*in* one pupa;" for each puparium contained only a single parasite. To make the subject still clearer, I will re-state. I took from the earth in my garden, around the root of a dead cabbage plant, twenty-six pupæ of the Cabbage Maggot (*A. brassicæ*), from which I bred two imagos; also six parasites which came out of the pupa-cases by gnawing a rough hole through the side near the extremity, after which I took from the remaining pupa cases three imagos, and one pupa of the Rove-beetle. My surprise was so great upon discovering the six Rove-beetles where I expected two-winged flies, that I carefully examined with the microscope the remaining pupa-cases, as also those from which the flies came, but could discover no break or orifice by which the Rove-beetles could have entered. It was after this examination that I opened the balance with the above-stated results; thus proving, so far as I can judge, that the fly larva was entered before its skin had hardened into the pupa-case. I add the following description, much against my inclination, for I do not believe in publishing single descriptions unconnected with some special paper upon the subject; and I only do so in this instance to more fully assist in the great work of Practical Entomology. I am indebted to Dr. Horn for the determination of the genus, and of the fact of its being unnamed.

Aleochora anthomyiæ, n. sp.—Length, 0.15 inch. Black, shining, covered with short decumbent silky hairs, coarsely punctured all over; the head and thorax less densely covered with hairs and punctures. Tarsi and more or less of the tibiæ light brown; head heavily and sparsely punctured, less so in front; antennæ with the first four joints glabrous, the remainder densely covered with a fine ash-gray pubescence, the fourth joint small, the terminal ones gradually enlarging and forming an elongate club, the last joint of which is twice as long as the preceding; palpi five-jointed, the last very small, resembling the same in the genus *Bembidium*; thorax nearly round, broadest behind, base and sides broadly rounded and with a fine margin only seen with a powerful magnifier, punctured like the head and with two longitudinal confluent lines of punctures leaving a smooth narrow dorsal space; elytra wholly black, more evenly and densely punctured, more hairy; body above more sparsely punctured, six segments depressed, gradually lengthening to the anal one, which is short and narrow without the raised lateral margin; beneath punctured and hairy as above. In one example the head and thorax have a faint coppery lustre. Six specimens examined.

PHILIP S. SPRAGUE.

BOSTON, MASS., Sept. 7, 1870.

ENTOMOLOGICAL JOTTINGS.

"CORN KERNELS IN COCOONS OF CECROPIA MOTH"—*Geneva, Ill., Nov.* 4, 1870—This is the heading of an article by our State Entomologist, on page 177 of the ENTOMOLOGIST AND BOTANIST, in which he mentions the fact (stated page 100) of a kernel of corn being found in the cocoon of of a Cecropia Moth. During the fall of 1869 I found five cocoons of the Cecropia Moth, all of which contained kernels of corn or of wheat, and in a sixth, found near the woods, was a small acorn.

Yesterday, while at work, I saw a flock of Chicadees (*Parus atricapillus*, Linn.), one of which I noticed had something in his mouth, which upon closer inspection proved to be a kernel of sweet corn. He was on a small apple tree when I first saw him, apparently trying to find some storehouse for his food, but failing to do so, flew on to the common board fence which enclosed the place, and running along till he found a board that was split, carefully deposited the corn in the crack of the board. Now, I believe that the Chickadee uses the cocoon of the Cecropia Moth as a storehouse, as well as the Blue Jay, if indeed he is not the sole proprietor.

S. F. C.

COLORADO POTATO BEETLE AROUND SPRINGFIELD—*Springfield, Mo., October* 4, 1870.—Some weeks since I sent you the Colorado Potato Bug in its larva state. We now find the perfect beetle. Have only seen a few dozens in all, and they are not found elsewhere than where first discovered on my grounds, though we have searched the vicinity. These few we treat as spies or precursors of an army, which we fear will be upon us in force next year. I am sure that I am correct in calling it the Colorado Potato Beetle. Since your visit last summer I have given more attention to *bugs*, and insects generally, and find a very great number of the injurious class, and I am very glad to see more than usual of the Cut-worm Lion, Sold i

Bug, Camel Cricket, &c. My conclusion is, that if attacked next year by an army of those terrible bugs we shall be at least able to show fight; and we hope to receive "tactics," "regulations," "general orders," &c., from the Bug Master General. D. S. HOLMAN.

LUMINOUS (?) LEAF-HOPPER—*Lancaster, Pa., Oct.* 10, 1870.—The article on page 335, in reference to "an electrical insect," reminds me of another fact. I have often noticed *apparent* electric sparks emitted from the end of the abdomen of a common species of *Tettigonia*, found on rose bushes and other vegetation in gardens—perhaps *T. obliqua*. Whatever the species may be, or whether this characteristic is common to more than one species, at all events I have often noticed it on dark, cloudy days, or while the insect was overshadowed by an overhanging leaf. These flashes or scintillations occurred about every five seconds, and continued at those intervals for half an hour, or, indeed, until the insect was disturbed. I have never noticed them early in the season, but towards the end of September and beginning of October, when the insects were less active than during warm weather. On bringing a magnifier down upon the insect, I found the tiny flash to proceed from an almost transparent member, which the insect quickly protruded from the caudal segment, and as quickly withdrew. This may be a common observation, but I have never noticed any allusion to it in any of my books on entomology. As I supposed this effect depended entirely upon the volition of the insect, I never attempted to capture one and place it on my hand to see whether it was accompanied by a corresponding shock. The flash was quite as large and brilliant in proportion to the size of the insect, as that of *Photinus*, but not so yellow and not so prolonged, but quick and bluish, like an electric spark.

S. S. RATHVON.

[The specimen inclosed by our correspondent is *Diedrocephala coccinea*, Forst.,=D. 4-*vittata*, Say, a very pretty green, yellow and crimson species, which is quite common on the Grapevine. No account of any such property in this species has ever, to our knowledge, been published; and as the species is so common, we greatly incline to believe the light was seen by Mr. Rathvon rather from a flash of the imagination than from a flash from the leaf-hopper. We have observed hundreds of these insects, and though they can hop around to the opposite side of any object, almost as quick as a flash, we have never seen the first sign of any luminosity about them. Upon corresponding on the subject with Mr. P. R. Uhler, of Baltimore, Md., who gives particular attention to the *Homoptera*, we find that he is as incredulous as ourselves about this luminosity. We make these remarks in all seriousness, and hope that they will have the effect to elicit the experience of others.—ED.]

THE VERBENA BUD-MOTH (*Penthina Fullerea*, Riley) IN THE WEST—*Kirkwood, Mo., Nov.* 9.—While gathering seeds from our Anthirrhinums, a few weeks since, I noticed that a number of the capsules of one particularly choice variety seemed to be infested by some insect, and I proceeded to search out the depredator, when a little mass of excrement indicated its place of ingress and egress. As I was picking away very carefully, suddenly a little shining, black head was thrust through the opening, as if to inquire what was making such a disturbance about its dwelling place, and presently the entire larva made its appearance, giving me a good opportunity to observe it without the danger of injuring it there would have been in dissecting the seed vessel. Upon comparing its appearance and habits with the figures and description on pages 204–5 of the AMERICAN ENTOMOLOGIST AND BOTANIST I more than suspected it was your *P. Fullerea.* A few days after I discovered it this larva changed to pupa. The cocoon was very slight, and could not be said to enclose the elongate, brown chrysalis, which protruded from the opening in the side of the capsule. The Moth issued in the course of two or three weeks, and proved to be, as I had anticipated, *Penthina Fullerea.* These larvæ seem to be very irregular in their development in regard to time, some being at this date (November 9th) not yet an eighth of an inch in length, while others are full grown. When bred in a jar they frequently change from one capsule to another that is fresher; and they have the peculiarity of coming to the outside whenever they are disturbed, instead of shrinking further into the recesses of their habitation, as we should naturally expect them to do. This insect is very pretty and interesting, but with the fate of Mr. Fuller's Tigridias and Mrs. Treat's Verbenas in my mind, I cannot say that I am very glad to note its appearance in our Western flower gardens.

MARY E. MURTFELDT.

THE ANTIOPA BUTTERFLY—*Ohio, Ills.*—On page 258 of "Packard's Guide to the Study of Insects," the chrysalis of this butterfly is described as "dark brown, with large tawny spots around the tubercles on the back." This summer I bred two specimens of *V. Antiopa* from the larva, and in each case the chrysalis was of a delicate gray color with fine dark markings, the tubercles tipped with black. Is there a difference between Eastern and Western species? G. M. DODGE.

[No; your description is correct, and Dr. Packard's was perhaps taken from a preserved specimen, though this chrysalis varies according to its age.—ED.]

PERIODICAL CICADAS IN GEORGIA—*Lafayette, Ga., Sept.* 26, 1870.—According to your prediction *Cicadas* appeared in this (the northwest) part of the State in great numbers last year (1869), and a few of the same variety appeared again this summer. They were here before, I think, in 1866. I have been informed that they appear during different years in the northeastern part of the State. A. R. MCCUTCHEN.

PERIODICAL CICADA NOT IN KREUTZ-CREEK VALLEY—*Lancaster, Pa., Oct.* 10, 1870.—I have made frequent inquiry in reference to the appearance of the *Cicada* in the "Kreutz-Creek" Valley the present season, but have not yet elicited an affirmative reply. The information which I gave you on this subject was on the authority of Mr. Joseph Windolph, an intelligent nurseryman from Marietta, in this county, who was in the habit of canvassing that part of York county in taking orders for and delivering nursery stock. It so happened that he did not operate in that district the present season. Whilst on a visit to Mr. W. in 1868, he informed me that he had been in the valley aforenamed, and that whilst there were Cicadas in abundance on the north side of the hills which form the northeastern border of York county, there were none on the south side, nor in the valley of Kreutz-Creek, and that the people residing there told him they would not appear in that locality until 1870. That is all I know about it. I made no personal observation on the subject. I had intended to visit the locality at the proper season, but I was too busily engaged.

[From the above information, and from Dr. Morris's letter, published on page 304, it becomes obvious that this Brood II of the Periodical Cicada (Brood III of our Missouri Report) is invalid. We created this Brood on the evidence of Mr. Rathvon, and in our Report we stated, on Dr. Smith's authority, that it might *possibly* appear in Jo. Daviess county, Ills., and in Vinton county, Ohio. We have long since suspected that the specimens which are said by Dr. Smith to have appeared in these two counties in 1853 were but precursors of the well established 17-year Brood, which is to appear next year (1871) in Iowa, Illinois, Michigan and Wisconsin; and as this Brood is also to appear in the "Pequea Valley," in Lancaster county, Pa., we must conclude that those observed in 1853 in the "Kreutz-Creek Valley" were likewise precursors of the same. Thus from year to year we are enabled to correct and revise the chronological history of this curious insect; and it is rather gratifying to know that of the twenty-two broods which we have predicted, this is the only one which has so far proved invalid; three of them (viz., our Broods 1, 2 and 4) having been duly confirmed. Next year a 17-year brood is to appear in the States already indicated above, and a 13-year brood in the extreme southwestern corner of Mississippi and in the adjoining part of Louisana. We shall be pleased to hear from our correspondents when the time arrives.—ED.]

REMARKABLE TENACITY OF LIFE IN A BUTTERFLY—*St. Louis, Mo., November* 17, 1870.—On October 22d I caught some specimens of that rare butterfly, *Paphia glycerium*, Doubleday, which I found flying in great numbers around willows on low ground. They hibernate, as you have suggested, in the perfect state, and seem to be endowed with a truly wonderful tenacity of life. One of the five ♂ specimens captured was still alive to-day, although twice drenched with chloroform, and pinned to a drying board. OTTO LUGGER.

DURING THE SUSPENSION.—We shall not remain entirely silent during the suspension of this journal. Dr. Vasey, we believe, will conduct a botanical department in the *Journal of Agriculture*, published at St. Louis by R. P. Studley & Co.; while we shall also occasionally be heard of through the columns of the same paper, and through Moore's *Rural New Yorker*, published in New York.

GALLS.—We have been paying especial attention the past year or two to our N. A. galls and their architects, and have received some most interesting ones from different subscribers. Will our readers bear in mind that specimens of galls, with mention of the tree upon which they occur, and other facts noticed, will always be gratefully acknowledged.

MATTER CROWDED OUT.—Though the index is printed on extra sheets we have been obliged to omit sundry articles from this number for want of space. Our acknowledgments of books and papers received, have been jostled out with the rest, and this will form our apology for seeming neglect.

HYBRID BETWEEN A GRAPE-VINE AND A HICKORY!—Our friend Thomas Meehan, of the *Gardener's Monthly*, has kindly sent us specimens of the Grape-vine Apple-gall (*Vitis pomum*, W. & R.), which was pronounced by the Newark, N. J., *Courier* to be produced by hybridization between a grape-vine and a hickory over which it grows. If the editor of the *Courier* will turn to page 106 of our first volume, he will find that his hybrid is in reality a gall caused by a gall-gnat; and that it was the poison injected by the little mother-fly, and not the pollen from the Hickory catkin, which produced the wonder.

DEATH OF NOTED ENTOMOLOGISTS.—The year 1870 has witnessed the death of several noted entomologists. Among them we may mention, with deep regret, the names of Julius Lederer, of Vienna, one of the most energetic Lepidopterologists, who passed away on the 30th of April; and of Jean Théodore Lacordaire, who was conceded to be the best Coleopterist of his day, and whose death at Liege, France, on the 18th of July, is still mourned by the entomological world.

OSAGE ORANGE FOR THE MULBERRY SILKWORM.—Our remarks on this subject, on page 293, have had the desired effect of bringing out the author's name. During the Fair week at St. Louis we had the pleasure of seeing Mr. Townend Glover, the entomologist to the Department of Agriculture, who showed us a letter from Mr. Samuel Cornaby, of Spanish Fork City, Utah county, Utah, reiterating the statement of his successes, and giving a more detailed account of his experience. This letter will be found in the Monthly Department Report for October. The scientific world will now place confidence in these interesting and important facts, whereas, as formerly presented, they lacked significance. We cannot be too circumspect in dealing with experiences and facts, and there is yet room for improvement in this regard in the Monthly Reports of the Department, as witness the records of damage done by THE Potato Bug, pp. 340-1, where the injuries of several distinct insects are all mixed up together under one common head. The difference in our own success and that of Mr. Cornaby in feeding Osage orange to the Mulberry Silkworm is owing, doubtless, to the greater dryness of the atmosphere of Utah compared with that of the Mississippi Valley.

GRAPE INSECT.—Among the articles we intended to publish this month was one on the true Grape Borer (*Ægeria polistiformis*, Harris), which, by an oversight, was omitted in our account of the Lepidopterous insects injurious to the Vine.

ANSWERS TO CORRESPONDENTS.

Insects Named—*Mrs. M. Chappellsmith, New Harmony, Ind.*—(1.) The little orange parasites on grasshoppers were, judging from your description, six-legged mites, belonging to Latreille's genus *Astoma*, and for which Mr. Walsh proposed the specific name of *locustarum*. Similar mites attack the common House-fly and other insects, but very little attention has been given to these minute creatures by scientific men. (2.) The dusky brown, short, robust cricket, which gnaws apples, pears, quinces and peaches, is the Striped-cricket (*Nemobius vitatus*, Harr); and this species consequently has these habits in common with the Jumping Tree-cricket (*Orocharis saltator*, Uhler), which you sent on a previous occasion. (3.) The larva, of which we received but the dry skin, was some species of cut-worm, but of course unrecognizable. (4.) The smooth black beetle is *Horinus lævis*, Oliv.

Moth of Saddle-Back—*T. C. Hill, Yellow Springs, Ohio.*—You will find a fair figure of the parent of this worm at Plate 1, Figure 7 of Harris's *Correspondence.* It is there called *Limacodes ephippiatus*, which is a synonym for the more appropriate name of *Empretia stimulea*, Clem.

Locust Borer—*Wm. R. Howard, Forsyth, Mo.*—The black and yellow-banded, long-horn beetle, which you found (Sept. 23) depositing its soft, elongate white eggs in the crevices of the bark of a Black Locust tree, is the beetle of the common Locust Borer (*Arhopalus robiniæ*, Foster). It is the larva hatching from these eggs which is so destructive to the tree. The *very* small brown fly which you noticed following the motions of the beetle was perhaps an egg parasite; but we cannot tell without seeing specimens.

The Northern Lady Bird; its Larvæ—*Chas. E. Billings, Philadelphia, Pa.*—The yellow larvæ, which are characterized by rows of branching thorn-like yellow spines, tipped with black, and which you found feeding on the leaves of the common yellow gourd, are the young of the Northern Lady-bird (*Epilachna borealis*, Thunberg), the only vegetable-feeder among all the North American Lady-birds (*Coccinella* family), though there are several European species that have a similar vegetarian habit. This insect has such a predilection for vines of the gourd family, and is often so injurious to squashes, that Dr. Fitch called it the Squash Coccinella.

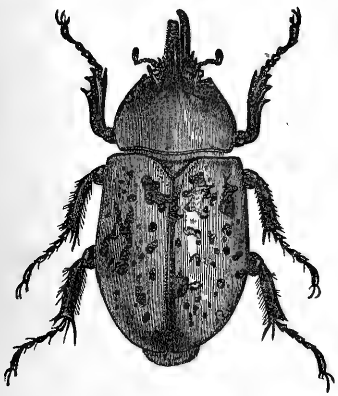
Not Eggs, but Parasitic Cocoons—*R. Couch, Fairbury, Ill.*—The worm you send is the Hog Caterpillar of the vine, and the white oval objects attached to its skin are parasitic *Microgaster* cocoons. Consequently both your friends are wrong, the one in persisting that they are eggs, the other in stating that they are lice. The former mistake is excusable, as they might readily be mistaken for eggs; but they bear no resemblance to lice, which are active creatures with limbs.

Do Gapes Occur in Pigeons!—*W. G. Barton, Salem, Mass.*—We have never heard of a case of Gapes in pigeons, and Dr. Paaren, of Chicago, informs us that his pathological literature from almost all parts of Europe does not mention pigeons among the birds affected with this parasite. Roup, however, is very common and fatal with them, especially in the fall of the year.

The Cabbage Plutella—*Chas. E. Bessey, Ames, Iowa.*—The small green worms which have been working most cruelly on your cabbages are, as you rightly conjecture, the larvæ of the small moths which you send in company with them. It is the same insect (*Plutella cruciferarum*) spoken of in answer to Wm. R. Howard in this number.

Gigantic Rhinoceros Beetle—*Subscriber, Jefferson City, Mo.*—The large beetle which you send, and

[Fig. 224.]



Colors--Glaucous-green, with brown spots.

of which we herewith present a portrait (Fig. 224), is a ♂ of the Gigantic Rhinoceros Beetle (*Dynastes tityus*, Linn). It occurs quite commonly in your part of the country, but is very rare in the more northern States, being in reality a southern insect. It breeds in the old stumps of several trees, and Say relates an instance of its occurring in considerable numbers in and about the cavity of a cherry tree which had been blown down by the wind in the neighborhood of Philadelphia. The colors of this beetle are very variable, as is also the shape of the spots upon the wing-covers. The horn also frequently occurs undivided instead of being bifid at the tip. The ♀ has a perfectly smooth thorax, and only a very small rounded tubercle on the head. We have a ♂ specimen in our cabinet which is of a uniform deep chestnut brown, and immaculate.

Bee-bread Devoured by Worms—*L. C. Francis, Springfield, Ill.*—The small moths which you send, and which in the larva state infest your old hives, living on the bee-bread and detritus, but never attacking the wax, as does the true Bee-moth (*Gallerea cereana*, Fabr.), are a species which was called by Dr. Fitch the Indian Meal Moth (*Tinea* [*Ephestia*] *zeæ*). He so named it because it is fond of feeding upon stale Indian meal. It has been bred from the dried roots of Dandelion, and as you find it in your bee-hives, nothing would seem to come amiss to it.

Rape Butterfly—*Jason E. Cowden, Amesbury, Mass.*—Yes; the worms which have done such great damage to your cabbages are the larvæ of the above-named imported insect.

Grape-leaf Gall—*H. C. Beardslee, Painesville, Ohio.*—The galls on the underside of your grape-leaves are the Clinton Grape-leaf gall, treated of in another part of this number.

✓ **Bean Weevil**—*Henry Kleinhaus, Nyces, Pa.*—The weevils infesting the beans from Porter Township, Pike county, in your State, but which are not found in your vicinity, are the native Bean-weevil (*Bruchus obsoletus*, Say), which we have on several occasions referred to.

Cabbage Insects—*Wm. R. Howard, Forsyth, Mo.*—Your cabbage insects came safely to hand. They are ✓as follows: No. 1, *Plutella cruciferarum*, Zeller, a cosmopolitan little cabbage pest, which has been unusually destructive in Missouri the present year. This same insect has long been well known in Europe under the name of *Cerostoma xylostella*, and was named *Plutella limbipennella* in this country by the late Dr. Clemens, so it has synonyms enough. No. 4, as you suppose, are pupæ of *Plusia brassicæ*, Riley. No. 3, *Strachia histrionica*, or the Harlequin Cabbage-bug (Fig. 56 of this volume). This is the first we have heard of its appearance in our State. No. 5—in tin box—is the chrysalis of the Troilus Swallow-tail (*Papilio Troilus*).

Two-Striped Walking Stick.—*C. R. Edwards, Bowling Green, Ky.*—Your insects are ♂ and ♀ of the above species (*Spectrum bivittatum*, Say). Never hesitate to send an insect for fear it is common. If it has attracted your attention from any beneficial or injurious quality, or from any peculiarity whatever, we shall always be glad to get it.

Ladder Spider—*Levi G. Saffer, Indianapolis, Ind.*—Your spider is *Epeira riparia*, Hentz, commonly known in this vicinity by the above popular name, on account of the curious zig-zag ladder-like silken trellis which it spins down the middle of its common web.

Sugaring for Moths; Preserving Larvæ—*H. S. Boutwell*—The sugaring and sweetening process for catching moths is about as old as the science of Entomology itself. *Papilio thoas* occurs in Illinois. We have had best success in preserving larvæ with a mixture made as follows: Diluted carbolic acid (1 part acid to 50 of water), 5 parts; alcohol, 4 parts; glycerine, 1 part. The glycerine should be dissolved in the acid before the alcohol is applied. It is difficult to prevent the crystals of carbolic acid from deliquescing and becoming discolored, and it is very essential to have a good article. We have so far found Calvert's Number 2, made in Manchester, England, the least subject to discolor. We kill our larvæ by a few moment's immersion in hot water. It is well to transfer the specimens, after they have remained in the above mixture a few weeks, to another which has a greater proportion of alcohol; for, after all, nothing has yet been found equal to alcohol for general purposes of preservation, and the other preparations are used principally to prevent too much shriveling and contraction in the specimens.

N. A. Lepidoptera Wanted—*Chas. G. Rotheram, Websdale, 78 High street, Barnstaple, England.*—The two persons who would be most likely to furnish you with eggs and pupæ of our N. A. Lepidoptera, are W. V. Andrews, Room 17, No. 137 Broadway, N. Y., and W. W. Butterfield, Indianapolis, Ind. We invite such of our subscribers who wish to exchange to correspond with Mr. Websdale.

Botanical Department.

DR. GEO. VASEY, EDITOR, Normal, Ills.

OUR NATIVE OAKS—No. 5.

We propose in this number to give a short account of the Red, Spanish, and Pin Oaks, and then a synoptical table of all the Oaks east of the Rocky Mountains.

[Fig. 225.]

Red Oak (*Quercus rubra*, L.)

The Red Oak (*Quercus rubra*, L.) is also quite as commonly called Black Oak, which shows the importance of designating such species by their proper botanical names. It is a larger tree than any of the others usually called Red or Black Oak, and is in its habitat rather more attached to the vicinity of streams. Very large trees of this kind may often be found in bottom lands, having a trunk three feet or more in diameter, and without branches to the height of twenty or thirty feet. The bark on the large trees is thicker and more deeply checked than on most of the other species. It is sometimes difficult to distinguish this from the variety *tinctoria* of *Quercus coccinea*, unless the eye has been trained to close observation of their characteristics. The leaves of *Quercus rubra* are usually larger, with about four lobes on each side; the lobes are also more uniform, and point forward more strongly toward the apex of the leaf. The acorns are much larger than in any of the varieties of *Quercus coccinea* (seldom less than one inch long), and are quite constant in size and shape. The cup is always shallow, and about as wide as the acorn is long. A variety, *runcinata*, found near St. Louis, has a narrower leaf, with more numerous and shorter lobes.

(Fig. 226)

Spanish Oak (*Quercus falcata*, Michx.)

This is a tree of large size, confined in its range mostly to the Southern States, occurring, however, in New Jersey, Pennsylvania, Kentucky, Southern Illinois, Missouri, and probably in all the States South. The leaves are usually long-stalked, large, and of peculiar shape, being rounded at the base and sending out on each side one or two long, narrow and somewhat hooked, or sickle-shaped, lobes; the apex, or point, being also sometimes much prolonged, narrow, and somewhat toothed; the under surface is covered with a rusty colored down. The acorn is small (rather less than half an inch), roundish, and in a shallow cup. The leaves of this species present considerable diversity of size and shape, probably in some cases as the result of hybridization. The bark is said to be excellent for tanning. A variety, *triloba*, found in New Jersey and elsewhere, is probably a hybrid between this species and *Quercus nigra*, L.

[Fig. 227.]

Pin Oak (*Quercus palustris*, DuRoi.)

The Pin Oak has a wide geographical range, but is abundant only in certain localities. It is found in low and swampy grounds, and in general appearance much resembles the Scarlet Oak (*Quercus coccinea*), and perhaps may yet have to be considered a variety of that polymorphous species. The leaves are deeply divided, with about three spreading lobes, the spaces between being broad and rounded toward the midrib. The acorns are small and roundish, about half an inch long, the cup very shallow and as broad as the length of the acorn. It is given by Dr. Cooper as extending from Massachusetts to the mountains of Georgia, and from Missouri to Texas. The name Pin Oak is said by some to come from the occurrence of numerous pins, or small dead branches, which often beset the lower part of the trunk.

In the following synoptical table it may be noticed that we have used some common names differently from those applied in the descriptions; thus we have taken the terms Black and Red Oaks to indicate sections rather than particular species.

The *Quercus coccinea* var. *vulgaris* (Fig. 212, p. 344) is what we take to be *Quercus coccinea* of the table. We believe the table will be found correct, and admitting as many species as the most judicious botanists are willing to concede. The reader will bear in mind that the synonyms are inclosed within parentheses.

Synoptical Table of the Oaks

EAST OF THE ROCKY MOUNTAINS, WITH THE PRINCIPAL SYNONYMS AND VARIETIES.

SECTION I.—Annual Fruited.

* White Oaks—Leaves lobed, deciduous.

1. Bur Oak, *Quercus microcarpa*, Michx.
   Var. *olivaeformis*, Gr., (*Q. olivaeformis*, Michx.)
2. Southern Overcup, *Quercus lyrata*, Walt.
3. Post Oak, *Quercus obtusiloba*, Michx., (*Q. stellata*, Wang.)
   Var. *parvifolia*, Chap., (var. *Floridana*, Shut.) [South.
4. White Oak, *Quercus alba*, L.

** Chestnut Oaks—Leaves with blunt teeth.

5. Swamp White Oak, *Quercus bicolor*, Willd., (*Q. Prinus*, var. *discolor*, Michx.)
6. Chestnut Oak, *Quercus Prinus*, L.
   Var. *monticola*, Michx., (*Q. montana*, Willd.)
   Var. *Michauxii*, Chap., (*Q. Michauxii*, Nutt.) [South.
7. Yellow Chestnut Oak, *Quercus Castanea*, Muhl., (*Q. Prinus*, var. *acuminata*, Michx.)
8. Chinquapin Oak, *Quercus prinoides*, Willd., (*Q. Prinus*, var. *chincapin*, Michx.)

*** Live Oaks—Leaves evergreen.

9. Live Oak, *Quercus virens*, Ait., (*Q. sempervirens*, Catesby.)
   Var. *maritima*, Chap. South.
   Var. *dentata*, Chap. South.

SECTION II.—Biennial Fruited.

* Willow Oaks—Leaves generally entire, thick and persistent, and some becoming evergreen far south.

10. Upland Willow Oak, *Quercus cinerea*, Michx., (*Q. humilis*, Walt.)
    Var. *pumila*, Michx., (*Q. pumila*, Walt., *Q. sericea*, Willd.)
11. Willow Oak, *Quercus Phellos*, L.
    Var. *laurifolia*, Chap. South.
    Var. *arenaria*, Chap. South.
    Var. *heterophylla*, (*Q. heterophylla*, Michx.)
12. Laurel Oak, *Quercus imbricaria*, Michx.
    Var. *Leana*, (*Quercus Leana*, Nutt.)

**** Black Oaks**—Leaves thick, widest at the top, slightly lobed.

13. Water Oak, *Quercus aquatica*, Catesby, (*Q. uliginosa*, Wang.)
    Var. *hybrida*, Chap. South.
14. Black Jack, *Quercus nigra*, L., (*Q. ferruginea*, Michx.
    Var. *tridentata*, (*Q*, *tridentata*, Eng.)
15. Black Scrub Oak, *Quercus ilicifolia*, Wg., (*Q. Banisteri*, Michx.)

***** Red Oaks**—Leaves mostly with deep spreading lobes, deciduous.

16. Spanish Oak, *Quercus falcata*, Michx., (*Q. elongata*, Willd.)
    Var. *triloba*, (*Quercus triloba*, Michx.)
    Var. *quinqueloba*, (*Q. quinqueloba*, Eng.)
17. Georgia Oak, *Quercus Georgiana*, Curtis.) South.
18. Scarlet Oak, *Quercus coccinea*, Wang.
    Black Oak, var. *tinctoria*, Gr., (*Q. tinctoria*, Bart.)
    Var. *ambigua*, Gr., (*Q. ambigua* and *borealis*, Michx.)
    Var. *microcarpa*, Ent. and Bot.
    Var. *depressa*, " "
19. Red Oak, *Quercus rubra*, L.
20. Pin Oak, *Quercus palustris*, DuRoi.
21. Catesby's Oak, *Quercus Catesbei*, Michx. South.

SOME INTERESTING PLANTS OF WESTERN MISSOURI.

BY G. C. BROADHEAD, PLEASANT HILL, MO.

There are many plants growing in the border counties of western Missouri, which range south and west, but are not found eastward. In the following notes I propose to call attention to some interesting plants of this region, particularly of Cass and adjoining counties.

On a rocky limestone slope, in the southern part of Jackson county, it was my pleasure three years ago to find a single plant of *Anemone Caroliniana*—only one, but it seemed very pretty in its loneliness. On these rocky glades the *Peucidanum*, with its pretty and fragrant leaves, the Prairie Dandelion (*Troximon cuspidatum*), two species of Vetch or *Astralagus*, and a very pale Larkspur (*Delphinium*) are often abundant. In richer soil we find *Corydalis aurea*. A beautiful and showy plant, generally growing on limestone slopes is the *Oenothera speciosa*, waving its large, white flowers gracefully with the breeze. It is common in the western border counties of Missouri, ranging southwestwardly into Kansas, but not found eastwardly. The *Talinum teretifolium*, a succulent leaved plant, with a modest, sweet looking pink-purple flower, is rarely found on rocky glades in Cass county. I have also found it in Iron, Cole and Newton counties, always occupying elevated, bold, rocky points.

On our creeks may be found *Thalictrum Cornuti*, *Isopyrum biternatum*, the beautiful scarlet Lobelia, and the blue *Lobelia syphilitica*, the modest *Collinsia verna*, with its blue and white petals, the *Mertensia Virginica*, some times called Blue-bell, the American Bellflower (*Campanula Americana*), and *Dipteracanthus strepens*, with its pretty, pale, purple flower.

In early summer the prairies are adorned with *Petalostemon violaceum* and *P. candidum*, with *Dodecathion Meadia*, *Amorpha fruticosa* and *canescens*, *Ceanothus Americanus* and *C. ovalis*. Later they are rich in a profusion of flowers, including *Echinacea purpurea*, *Liatris*, two species, several species of *Aster* and *Solidago*, *Polygala incarnata*, and the *Gentiana puberula*, lingering the very last flower of the season, of a deep, rich, purplish blue.

The *Leguminosæ* is well represented, and offers to us such plants as *Desmanthus brachylobus* and *Schriankia uncinata*, or Sensitive-brier. On limestone slopes is sparingly found that curious leaved plant, *Mentzelia obligosperma*, covered over, leaf, stalk and calyx, with minute barbed hairs, presenting under the microscope the appearance of a forest of fir trees with pendent limbs.

Among Endogenous plants we have two species of Ladies Slipper (*Cypripedium*), the Wild Hyacinth, (*Scilla Fraseri*) the White Dogtooth Violet (*Erythronium albidum*), the *Tradescantia Virginica*, T. *pilosa*, and others more common.

Besides those enumerated I will only mention Sedum pulchellum, Boltonia latisquama, a very tall, large flowered Helianthus [probably H. Maximilian—Ed.], two species of Wild Sage, *Salvia azurea* and *S. trichostemoides*, and *Amphiachyris dracunculoids*, a showy, yellow flowered plant, resembling a Solidago, and some times called Tumble-weed on account of the dead bushy plants being blown about by the autumnal winds.

The arborescent grasses constitute one of the most beautiful adornments of tropical vegetation. These grasses belong chiefly to the *Bambusa* (Bamboo) and other related genera. In India the seeds of the Bamboo are mixed with honey and eaten like rice. In South America an arborescent grass, the gigantic *Guadua*, attains a height of from 50 to 60 feet. Another species, a powerful climbing grass, twines round the trunks of large trees, reaching to their tops. A species of Cane (*Arundinaria*) grows in large tufts, reaching a height of 30 to 40 feet, of which the first joint rises without a knot to a height of 16 feet before it begins to bear leaves. These joints being hollow, are used as blowing tubes by the Indians, for the discharge of their arrows. Even in the Southern United States the stalks of *Arundinaria* furnish fishing-rods of the best description.

THE GERARDIAS.

W. W. BAILEY, PROVIDENCE, R. I.

[Fig. 228.]

(*a*) Flowering branch of *Gerardia pedicularia;* (*b*) flowering branch of *Gerardia purpurea*.

The genus *Gerardia* furnishes some of the most charming wild flowers of the late summer or early autumn in New England. It is to be regretted that these lovely plants cannot be cultivated, but I believe that owing to their being root parasites all efforts to domesticate them have hitherto failed. I do not know how carefully or persistently the attempt has been made, but as the plants seem hardy in their native locations it is possible that by study of their habits, and by the removal of much surrounding earth, so as to transplant the nourishing stems at the same time with the *Gerardias*, success might yet attend the gardener. Still this experiment must have been tried, or Dr. Gray would not pronounce them "uncultivable."

This showy genus is a member of the order *Scrophulariaceæ*. In my rambles about Providence I have secured five species. Of these *G. flava* blooms earliest, and may be found in open woods. It has large, yellow, handsome flowers, in their appearance suggesting the fox-glove. The interior of the tube, as well as the anthers and filaments, is woolly. The leaves are large and entire, or, according to Gray's Manual, "the lower usually sinuate toothed or pinnatifid" The *G. quercifolia* I have not found so frequently. It is known by its oak-shaped leaves, and in general appearance closely resembles the preceding. The *G. pedicularia* is (Fig. 228,*a*) exceedingly common with us. I have often found it over three feet high. It is much branched, the flowers of a delicate texture, yellow, and very fragrant. They are much frequented by humble and other bees and insects. The corolla is covered both outside and in with minute glandular hairs, slightly viscid to the touch, and the interior of what may be called the lower lip is marked by two parallel rows of reddish dots. The leaves, and even the lobes of the calyx, are beautifully serrate. All these yellow flowered species are difficult to preserve neatly. Despite all my care I have never been able to prevent their blackening in the press. If any one has been more successful in preserving their color, I should be glad to learn the process.

The two purple varieties are much more delicate in appearance than either of the preceding, and bloom simultaneously. They are the species *purpurea* (Fig. 228, *b*) and *tenuifolia*. They are both common here—the *purpurea* along the road sides and in swampy grounds, which are, however, at this time dry; the *tenuifolia* in dry woods. Both of them are much branched. The first has quite short peduncles, and rather larger flowers than the *tenuifolia*, whose peduncles are long and thread-like. My illustrations represent merely the extreme end of the flowering branches of *G. pedicularia* and *purpurea*. I have not on hand at present any specimens of the other species I have mentioned from which to make drawings. I hope, however, that the sketches I have presented, and these few words, may call attention next year to a beautiful genus, finely represented at the West.

DISTRIBUTION OF IMMIGRANT PLANTS.

BY DR. FRED. BRENDEL, PEORIA, ILL.

The distribution of immigrant plants, and the year of the first appearance of such, should be carefully noted for each locality by the botanists of the West. Such records would be of great benefit to the study of botanical geography and the history of plants.

Here follows the statistics of vegetable immigration in the vicinity of Peoria, Ill.

1. Immigrant plants common and entirely naturalized since an unknown period:

Sisymbrium officinale, Sinapis nigra, Capsella bursa-pastoris, Hypericum perforatum, Portulaca oleracea, Malva rotundifolia, Sida spinosa, Abutilon Avicennæ, Trifolium pratense, Xanthium strumarium, Maruta cotula, *Lappa major, Plantago major, Verbascum thapsus, Marrubium vulgare Solanum nigrum, Chenopodium album, hybridum, urbicum, botrys* and *ambrosioides, Amarantus hybridus* and *albus, Polygonum persicaria* and *convolvulus, Rumex crispus, Cannabis sativa, Alopecurus pratensis, Phleum pratense, Agrostis alba, Poa compressa, Eragrostis poœoides*, var. *megastachya* and *pilosa, Bromus secalinus, Panicum sanguinale, Setaria glauca.*

2. Immigrant plants found eighteen years ago in single specimens, now in great abundance:

Sonchus asper, Linaria vulgaris, Leonurus cardiaca, Echinospermum Lappula, Cynoglossum officinale, Rumex acetosella.

3. Plants immigrated since an unknown period, and found in limited numbers or single localities:

Trifolium pratense, Dactylis glomerata, Panicum glabrum, Veronica arvensis, Rumex obtusifolius.

4. Immigrant plants not known here eighteen years, and now represented in limited numbers and single localities:

Verbascum Blattaria, Vaccaria vulgaris, Glechoma hederacea.

5. Adventitious plants not yet truly naturalized:

(*a.*) In waste places: *Camelina sativa, Saponaria officinalis, Malva sylvestris, Hibiscus trionum, Martynia proboscidea, Nepeta cataria, Nicandra physaloides.*

(*b.*) Mostly escaped from cultivation, or purposely introduced: *Argemone Mexicana, Nasturtium armoracia, Melilotus alba, Rosa rubiginosa, Pastinaca sativa, Anethum graveolens, Inula Helenium, Helianthus annuus, Tanacetum vulgare, Centaurea cyanus, Mentha viridis, Satureja hortensis, Ipomea purpurea, Polygonum orientale, Fagopyrum esculentum, Asparagus officinalis, Phalaris Canariensis, Setaria Italica.*

6. Plants found eighteen years ago, and not seen since:

Raphanus raphanistrum, Leucanthemum vulgare. The latter would certainly have spread if not incorporated in my herbarium.

7. Common plants, the introduction of which is doubtful or contested.

Polygonum hydropiper, Poa pratensis, Panicum crus-galli, Datura Stramoniun var. Tatula.

In Europe various species of Heaths cover large tracts of country; many of them are of rare beauty. But in Africa the most varied assortment of Heaths of the genus *Erica* are found.

BOTANICAL NOTES.

BY E. M. HALE, M. D. CHICAGO, ILLS.

While on an excursion, during the last week of August, to the western shore of Lake Michigan, or that portion of it which extends between Green Bay and the Lake, I met with some facts worthy of notice, relative to the condition of certain plants in that locality.

The 45th degree of latitude crosses the peninsula nearly at its middle. From Manitowoc to Death's Door, a distance of nearly a hundred miles, the shore is very interesting to the botanist. Nearly the whole distance, high bluffs bound the lake, while here and there a river quietly flows in, having on each side a lower level. At the mouth of Wolf river, I observed a peculiarity similar to that mentioned by McGregor, in "Rob Roy on the Jordan." This canoe-traveler, in his voyage on the Jordan, observed that a bank or bar of sand or gravel had formed nearly across its mouth, where it empties into the Sea of Galilee. In the early days of Chicago, the river had just such a bar across its mouth, and found an outlet into the lake at an extreme corner. But in the case of Wolf river, the bar extends completely across its mouth, and the water of the river has to filter through it into the lake; and admirably is this effected, for while above the bar the river is almost black with the refuse of tanneries, mills, etc., below the bar, not more than ten or fifteen feet, the water is clear and pure.

The forests here are composed of Hemlock, Pine, Cedar, Maple, and the more common trees. Here, for the first time, I observed the beautiful Mountain Ash (*Pyrus Americana*) growing wild on the lake shore. The terminal branches have a bark nearly as scarlet as the berries, and the tree grows over twenty feet in height. One old tree, leaning over the bluff, has seen many storms, for its trunk, four inches in diameter, was rough and hoary with mosses and lichens.

All along the shore up to Wolf river I had observed the bright red berries of the Dwarf Cornel (*Cornus Canadensis*), but here along the shore of the river I found great quantities of it in bloom. The usual flowering season of this plant is May and June. I did not observe any berries on the plants at this place. Here, too, in abundance, was tne wild Strawberry (*Fragaria Virginiana*) in full bloom! But the people said it had fruited in July.

There are some climatic peculiarities of this locality. Although only thirty miles west of the city of Green Bay, navigation opens here three or four weeks earlier than at the latter place, and the ice does not block up the harbor for several weeks after boats cease to run to Green Bay city. Do the before named plants have a double season of flowering in this locality?

The varied hues of the foliage of trees, especially the smaller species of Maples, was very beautiful, clearly showing that the change in the color of the leaf is due to an actual ripening, and not to the action of frost.

RUE-LEAVED SPLEENWORT.

(*Asplenium ruta-muraria*, L.)

BY J. WILLIAMSON, LOUISVILLE KY.

[Fig. 229.]

Rue-Leaved Spleenwort (*Asplenium ruta-muraria*, L.)*

This fern is a spleenwort, belonging to the genus *Asplenium* of the great group of *Polypodaceus* Ferns. This group is distinguished from the other two groups, *Osmundaceæ* and *Ophioglossaceæ*, by having their spore cases girt with an elastic ring.

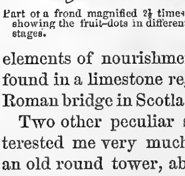
The word *Asplenium* was applied by old authors to those kinds of ferns that were supposed to possess some virtues in curing diseases of the spleen. Modern authors classify the Spleenworts and all other Ferns on a more definite principle, that is, the arrangement of the fruit, or *sori*, and the form of the *indusium*, or fruit-cover.

Asplenium ruta muraria is a small evergreen fern two to four inches long; root tufted, fibrous; stalk smooth, with one groove on the upper side, slightly round on the back; fronds bi-pinnate below, simply pinnate above; pinnules rhombic-wedge-shaped, toothed at the apex, sometimes deeply cut, without a mid-rib, the veins rising irregularly from the base of the pinnule towards each serrature; involucre or indusium elongate, opening inwardly, with a sinuated margin, especially so when burst; whole plant smooth and having a glaucous-green color.

I found this fern and the delicate Rock-brake (*Pellea gracilis*) growing on the same rock, in a very exposed situation. Their tufted roots were embedded in the crevices of the rocks, so that it was with some difficulty that good specimens could be obtained; but by breaking the rock and using a little patience the difficulty was overcome. On visiting the same district on the 4th of July, I found some beautiful specimens growing in a sheltered situation; their roots were embedded in the moss which grew upon the rocks. Some of the fronds measured fully five inches in length.

In England and Scotland this fern is named the Rue-leaved Spleenwort, or Wall-rue Fern. It is what is termed a mural species, from its general habitat, growing usually on old walls. It is found very frequently on old castles, old towers, and old bridges. Lime appears to be one of its chief elements of nourishment, at least it is always found in a limestone region. I have seen an old Roman bridge in Scotland almost covered with it.

[Fig. 230.]



Part of a frond magnified 2½ times, showing the fruit-dots in different stages.

Two other peculiar situations in Scotland interested me very much: one was on the top of an old round tower, about eighty feet high; the other in a well about four feet from the surface. There were only a few plants growing in each place, and no others within a radius of fifteen miles. It is strange that the spores would have settled in two situations so extremely different. The specimens growing in the well were large, soft, and delicate; those on the tower small and crisp.

The specimen in my herbarium is three and a half inches long, and something similar to the above illustration, with this exception, the pin-

* Explanation of the Figure.—*a*, Plant, natural size; *b*, back of the frond, showing the *sori* or fruit dots; *c*, upper side of the fronds; *d*, young fronds growing from the tufted rootstock showing their circinate vernation; *e*, old fronds broken off.

nules are not so much cut off. It is from the west coast of Scotland. I found it growing with *Asplenium marinum* and *A. adiantum nigrum*, on exposed rocks that were washed by the waves of the Atlantic.

From the above description it would be difficult to define the exact habitat or range of this rare little fern.

THE ROCKY MOUNTAIN ALPINE REGION.

BY C. C. PARRY, WASHINGTON, D. C.

(*Selected.*)

The wooded belt of coniferous trees that, with irregular local interruptions, clothes the Rocky Mountain slopes, commences by a somewhat scattering growth near their base, at an average elevation of six thousand feet above the sea. This belt acquires its densest growth, and exhibits the greatest number of distinct species, between seven thousand and nine thousand feet elevation, and terminates by an abrupt well-marked line at an average height of eleven thousand three hundred feet.

These plainly recognized features are readily explained by reference to the corresponding climatic conditions here exhibited. Thus the growth is most dense and varied where the exposures present a suitable condensing surface, and where there is the greatest and most regular amount of aqueous precipitation, caused by a mingling of the cool descending currents of air from the higher elevations meeting the warm ascending currents charged with moisture from the heated plains below; at this irregular point of junction, summer rains and dews are frequent, and the conditions for arborescent growth are most favorable. At still higher elevations the actual limit of tree growth is determined by conditions of temperature, which satisfactorily explain the peculiar features of vegetation here met with.

Most noticeable of these is the singular abruptness by which this limit of upright tree growth is here marked. You are struggling through a tangled maze of fallen timber and dense underbrush, overshadowed by tall trees with spreading roots bedded in a saturated spongy soil, when suddenly, without any sensible dwarfing of intermediate forms, you come upon open spaces, where stunted trees, fantastically gnarled and twisted, with depressed flattened summits, offer little obstruction to the open view above. Through these obstructions, stepping on the very tops of matted trees, which a few rods below rear their pointed spires to a height of thirty to forty feet, you come upon the bare alpine slopes, which continue with variously interrupted rocky exposures to the dividing ridge two thousand to twenty-five hundred feet higher.

In the absence of any continuous meteorological observations at or above the timber line, the most satisfactory explanation of the peculiar features here presented is this: The so-called timber line marks the extreme point of *minimum* winter temperature, below which no exposed phenogamous vegetation can exist. All that survives above this point does so by submitting to a winter burial of snow, beneath which protecting cover it is enabled to maintain its torpid existence. The early autumnal fall of snow commences in the latter part of September, and receives constant additions through the fall and winter months, during which it retains its light feathery texture, and is not sensibly wasted by melting till the clear lengthening days of early summer dissolve them rapidly, giving origin to the dashing streams that pour down the upper valleys.

It is the pressure of this accumulating weight of snow that gives the fantastic shape to the tree vegetation, that struggles for existence above the well marked timber line, and we can readily note instances, here and there, where from some peculiar condition of wind, or a limited amount of winter snow in particular seasons, points and patches of dwarfed tree growth being left unprotected, have been blasted and destroyed. Otherwise we can observe still more frequently where ambitious upper branches projecting into the sunlight of this Arctic winter, have been nipped and killed. In these unmistakable signs of the struggle for vegetable existence are also exhibited some of the most peculiar and marked features of the Alpine scenery. This dwarfed tree growth, persisting above the timber line, is as we might naturally suppose confined to sheltered valleys, or on the lea-side of abrupt rocks, where the drifted snow lies heaviest. The point of greatest snow accumulation is mainly determined by the shelter afforded along the upper line of the timber growth, at which locations the snow drifting from the bare spaces above is lodged, hence early in the thawing season these locations offer the principal obstructions to travel, presenting treacherous fields of snow, often overarching rushing torrents; here also the vegetation is longest delayed, and is comparatively meagre. It is on the more open exposures above that the alpine flora offers its greatest variety and most attractive features, and through a brief flowering period, extending from June to September, presents a succession of forms and colors, attractive to the eye of a naturalist, and such as is nowhere else so comprehensively exhibited. As these alpine plants owe their existence to the protection afforded by winter snow, they naturally include a number of species that also flourish at lower elevations. Thus in the accompanying list of alpine plants, out of one hundred and forty-two species, I note fifty-six as exclusively confined to the alpine exposures. The usual characters of alpine plants here, as elsewhere exhibited, consist in a dwarfed habit of growth, late period of flowering and early seeding, the forms being almost exclusively perennial.

Of Phenogamous plants persisting to the highest elevations, reaching to fourteen thousand feet and upwards, we may enumerate the following: *Thlaspi cochleariforme*, *Claytonia megarrhiza*, *Trifolium nanum*, *Oxytropis arctica*, *Saxifraga serpyllifolia*, *Androsace chamæjasme*, *Chionophila Jamesii*, *Eritrichium aretioides*, *Polemonium confertum*, *Gentiana frigida*, *Salix reticulata*, *Lloydia serotina*, *Luzula spicata*, *Carex incurva*, *Poa arctica*.

Of the thirty-four natural orders represented in the alpine flora, thirty-one belong to *Phenogamous* plants, the remaining three include the higher orders of *Cryptogams*, of the latter, Ferns are represented by a single species, not exclusively alpine (*Cryptogramme acrostichoides*, R. Br.) Mosses are more numerously represented, but are still comparatively rare, while Lichens are most abundant and afford the greatest number of species.

Of the Phenogamous orders twenty-seven belong to *Dicotyledons*, four to *Monocotyledons*. Of these the natural order, *Compositæ*, comprises the largest number of species, viz.: twenty-four included in thirteen genera; *Ranunculaceæ* has five genera, seven species; *Cruciferæ*, five genera, six species; *Caryophyllaceæ*, five genera, six species; *Leguminoseæ*, two genera, four species; *Rosaceæ*, four genera, five species; *Saxifragaceæ*, two genera, nine species; *Primulaceæ*, two genera, four species; *Scrofulariaceæ*, six genera, ten species; *Gentianaceæ*, two genera, six species; *Salicaceæ*, one genus, four species; *Conifereæ*, three genera, five species; *Juncaceæ*, two genera, seven species; *Cyperaceæ*, one genus, four species; *Gramineæ*, five genera, nine species. Of large families entirely unrepresented we may note *Solanaceæ*, *Labiateæ*.

The superficial extent of these bare alpine exposures can only be approximately estimated in the absence of any exact topographical measurements. Taking the main mountain mass extending through Colorado Territory, or between 37°, and 41°, north latitude, including the high offsets and detached peaks, rising above eleven thousand feet, it would be safe to allow an average width of five miles, for the entire distance, in a straight line, representing in round numbers an area of from twelve hundred to fifteen hundred square miles. Throughout this extent there is great uniformity in the vegetation presented, though agreeably varied by the different exposures or conditions of soil and moisture. Wherever the peculiar texture of the underlying rock has favored disintegration, and the accumulation of soil, a rich alpine sward is presented, made up of densely matted grasses, carices, and plants adapted to pasturage. Here the mountain sheep the elk, and the Rocky Mountain goat, graze during the summer months, and the mountain ptermigan, and dusky grouse feed and rear their young. When once made accessible it will, no doubt, afford a favorite resort for summer pasturage, and may eventually yield choice dairy products equaling those of the Swiss Alps, or produce delicate fibrous tissues, rivaling those of the looms of Cashmere.

As a sanitary retreat during the summer months it is unexcelled in the purity and coolness of its atmosphere, the clearness of its flowing streams, and its picturesque extended views. There are no elevated points that cannot be safely ascended, and dangers from snow avalanches, or land slips, are so rare as not to be taken into consideration. Of the high culminating points met with in the district under review, including Long's peak on the north, and the Sierra Blanca on the south, there is a remarkable uniformity in the average elevation; all as far as accurately measured rising above fourteen thousand feet. Gray's peak in the dividing ridge, which is now a point of common summer resort, so far carries the palm in an elevation of fourteen thousand two hundred and fifty-one feet. Its associate peak (which it is most earnestly hoped may bear the appropriate name first proposed, of Torrey's peak, in commemoration of the early botanical labors of our veteran American botanist) is thought to be somewhat higher, an interesting point which will no doubt be determined by Professor Whitney in his present summer's exploration of that region.

Plants of the Cactus family are principally confined to the Western continent, and although most abundant in tropical regions, some forms extend far into the temperate zone, and some species even have an alpine character. Back, in his northern expedition, saw with astonishment the banks of the Rainy Lake, in latitude 48° 40′, entirely covered with the prickly pear (*Opuntia vulgaris*). Humboldt found on the Andes several species of Cactus on elevated plains from 9,000 to upwards of 10,600 feet above the level of the sea. Some have even been gathered at an elevation of 13,600 feet. In size and height the different kinds present remarkable contrast. In Mexico and Arizona many kinds assume an arborescent form. Other kinds have a globular form, some with a diameter of three feet, and attaining a weight of 2,000 pounds, while a Cactus in South America is so small and so loosely rooted in the sand that it gets between the toes of dogs.

Palms are the loftiest and most stately of all vegetable forms. To these, above all other trees, the prize of beauty has always been awarded by every nation. Marked with rings, and not unfrequently armed with thorns, the tall and slender shaft of this graceful tree rears on high its crown of shining, fan-like, or pinnated leaves, which are often curled like those of some grasses. Smooth stems of the Palm sometimes rise to a height of one hundred and ninety feet. It diminishes in size and beauty as it recedes from the equatorial toward the temperate zones.

Vitality of Seeds.—There is much mystery about this subject. We recently read in a New York paper that on the clay from a deep well, plants of *Sinæpis arvensis*, the "Yellow Charlock," grew, the seeds of which "must have been there for ages." As this is not an American plant, but one which has followed the footsteps of the white man, of course there must be an error here. We have no doubt it is so with all the cases of so-called vitality, not even the supposed well attested cases of forests of trees growing up after a fire in the West, different from that which grew before, from seed which had been for years in the ground.

Farmers say that when they plow up old sod which has been that way for many years, and note the rag weed and white clover which spring up, that these seeds are natural to the soil, or have been there for a long time; but there is no doubt but that this is wrong. The most careful analysis of these soils fails to detect their presence, which it would certainly do if they were there. Though surely there is not near the vitality in seeds accorded to them, there is really much more than is generally supposed. It is rather how they are kept than any peculiar limit to their age which determines their goodness. We know the time when we supposed it necessary to keep Magnolia seeds moist from the time they were gathered till they were sown in the spring. Once we found a package which had been thrust under a rafter in a tool shed in the spring, which grew as well as any. More recently Mrs. Col. Wilder found a package of *Magnolia soulanyeana* seed in Mr. Wilder's wardrobe, which had been there between two and three years, and which on sowing produced a plant from every seed. Yet the belief is next to universal that Magnolia seed is one of the most transitory in its hold on vitality that we have.

These facts show us that we really know little about these matters yet; and they should stimulate practical men to careful experiment as to what are really the laws which govern the preservation and germination of seeds.—*Gardener's Monthly*.

Study of Natural History.—"For many years it has been one of my constant regrets that no schoolmaster of mine had a knowledge of natural history, so far at least as to have taught me the grasses that grow by the wayside, and the little winged and wingless neighbors that are continually meeting me with a salutation which I cannot answer, as things are. Why did'nt somebody teach me the constellations too, and make me at home in the starry heavens which are always overhead, and which I don't half know to this day? I love to prophesy that there will come a time when, not in Edinburgh only, but in all Scottish and European towns and villages, the schoolmaster will be strictly required to possess these two capabilities (neither Greek nor Latin more strict), and that no ingenious little denizen of this universe be thenceforward debarred from his right of liberty in those two departments, and doomed to look on them as if across grated fences all his life!"—*Carlyle, in Edinburgh Courant*.

NOTES FROM CORRESPONDENTS.

We have a communication from Prof. G. H. French, relative to some interesting plants of Southern Illinois, observed during a vacation trip. Our space permits us to present only some of the more prominent statements:

About two and a half miles from Makanda is a ledge of rocks known as Giant City, consisting of numerous large blocks of sandstone—a wild and romantic place. Here I found some interesting ferns, among which were beautiful specimens of the Walking Fern (*Camptosorus rhizophyllus*) *Woodsia obtusa*, *Cystopteris fragilis*, *Asplenium trichomanes* and *Aspidium acrostichoides*.

Besides ferns, I found here a rare *Heuchera*, the same as described in number 10, p. 310. It grows from the sides of the cliffs, and rarely on the ground at the base of the cliffs. The whole plant is viscid-pubescent, the scape a foot to eighteen inches high, the panicle about six inches long, and three to four inches wide.

A ledge of rocks about four miles northwest of Makanda has the local designation of Fern-rocks. Among the most interesting things here was the *Asplenium pinnatifidum*. It grows in considerable abundance here, though I found it in no other place. This delicate fern is an interesting plant, both on account of its rarity and its manner of growth. It grows from crevices in the sides of the cliff, in the driest places, seeming to avoid moisture. The roots penetrate the narrow crevices, so that it is difficult to dislodge them with a knife. There is an inclination, I see, among botanists to class this plant with the Walking Fern, and I should say with much propriety. Although I did not find it rooting at the end of the frond, I doubt not it would if it could find place to root.

Growing from a moist moss-covered rock near by I found a bunch of the delicate *Asplenium Felix-fœmina*, its large though delicate fronds contrasting strangely with some small specimens of *Asplenium ebeneum* growing at no great distance. But among the most beautiful is the Maiden-hair fern (*Adiantum pedatum*), that grows all through the woods in this vicinity Other ferns growing common here were the two Polypods (*Polypodium vulgare* and *P. hexagonopterum*), the common Brake (*Pteris aquilina*), the sensitive fern (*Onoclea sensibilis*), *Aspidium marginale* and *A. acrostichoides*.

I found at the base of the ledges a peculiar Dodecatheon. The leaves are orbicular, crenate-dentate, or sometimes entire, of a pale green color and thin, obtuse at the base and not tapering to the petiole. Scape from six to twelve inches high, and from one to ten flowered. The flowers were all gone, but the capsules were not more than half as large as those of *Dodecatheon meadia*. It grows in the sand made from the disintegrated rocks of the cliffs. It is at least a marked variety of *D. meadia*, if not a new species.

Various species of *Desmodium* grow here in the woods and fields, several of which are worthy of notice. In one place I found a specimen of *Desmodium nudiflorum* having two scapes, one naked the other bearing about midway a tuft of leaflets. The shape of the leaflets and other characters were decidedly *D. nudiflorum.*

Near Cobden I found a specimen of *Desmodium pauciflorum* with the scape coming out at the base of the plant, as in *D. nudiflorum*, but having a tuft of leaflets at about the middle. In this plant the shape of the leaves was that of *D. pauciflorum.* I also found several specimens that seem to combine the habits of *D. pauciflorum* and *D. acuminatum.* They were not more than ten or twelve inches high, and about midway had a node of leaves from which rose a short scape, or flower-stalk, bearing a few flowers of the color and size of those of *D. pauciflorum.* The leaves were very much pointed, like those of *D. acuminatum.* Do these peculiarities show a hybridization in these species, or are they variable forms of one species?

Prof. E. J. Hill, of Kankakee, Ill., communicates notes and specimens of a few interesting plants, from which we give the following extracts:

I inclose a specimen of *Juncus Greenii.* In some specimens the involucral leaf is 6 inches long. The pods are longer than the sepals, and blunt. It has one or two involute thread-form leaves at the base. The cymes are large, making a heavy head; and the plant stands up rigidly, growing from 18 inches to 2½ feet high. Its locality is the prairie north of the Kankakee river, and it was quite abundant. There was considerable sand in the soil. I find in the same soil *Scleria triglomerata*, Michx., and a *Fimbristylis* which I take to be *F. spadicea*, Vahl.

I mentioned to you *Rhynchospora cymosa*, Nutt. After a thorough reëxamination, I can make nothing else of my specimens. The leaves are linear, flat and keeled. The culm is leafy, triangular, smooth, 10 to 20 inches high, with terminal and axillary cymes. I found it in the sandy barrens west of here, growing in the edge of sloughs. The *Fimbristylis* grew in the same locality.

I spoke to you of a tall *Hemicarpha subsquarrosa.* By actual measurement I find the tallest 8½ inches high. It was probably due to the fact that they grew in the shade, in the midst of a dense growth of *Eragrostis reptans*, and various taller weeds, on a low inundated island of the river; the richness of the soil and the struggle for sunlight stretched them out.

I inclose a specimen of *Conobea multifida*, Benth., about which there seems to be some discrepancies of description. Dr. Gray says: "Upper lip of the corolla 3-lobed, the lower 3-parted. Style 2-lobed at the apex, the lobes wedge-form. Leaves opposite. Flowers small, solitary, on axillary 2-bractleted peduncles."

It is described by Michaux (Flor. Bor. Am.) as *Capraria multifida.* He says: "Corolla campanulate, 5-parted, acute. Capsule 2-valved, 2-celled, many-seeded. Leaves ternately verticillate, many-parted; pedicels solitary."

Sprengel (Syst. Veg.), under *Capraria*, describes the capsule as 2-celled, valves 2-cleft. Under *Herpestris* he says: "Capsule 2-celled, 2-valved, valves 2-parted." The last is the case with this plant, the valves being finally 2-parted. Sprengel characterizes *Conobea* thus: "Calyx tubulous, 5-dentate, 3 bracts at the base; corolla 2-lipped, upper lip emarginate, lower lip 3-lobed; capsule 4-valved, etc."

By stretching a point the 2-lipped corolla can be made out, and the final result with the capsule is the 4 valves. But I find neither 3 bracts nor 2 (Gray), nor opposite leaves alone, but mainly verticillate, and the style more like that of *Herpestris*.

The result I find to be a good specific distinction in Michaux's Flora, but a mingling of the elements of three genera in my books, viz: *Conobea*, *Herpestris* and *Capraria* (as to the corolla).

We have examined the specimen sent by Mr. Hill, and also others from Southern Illinois, and find his remarks as to the characters fully sustained. In the dried specimens we have not been able to make out the structure of the corolla.

Charles H. Peck, of Albany, N. Y., writes as follows concerning the white fruited form of Strawberry noticed in our last issue:

Fragaria vesca, with white fruit, grows in Rensellaer county, in this State. A gentleman of my acquaintance transplanted some plants to his garden, placing both red and white fruiting varieties in the same bed. They have exhibited no apparent tendency to mix, or form intermediate varieties; but under cultivation they present a peculiar appearance. The flowering stem becomes dichotomously branched above, the branches growing quite long, and the primary ones being subtended by a well developed leaf. The fruit is produced throughout the season, so that these plants become an "Everbearing Strawberry."

ANSWERS TO CORRESPONDENTS.

Plants to Name.—*Miss Mary E. Murtfeldt, Kirkwood, Mo.*—No. 1 is *Astragalus Mexicanus;* No. 2, *Coreopsis aristosa;* No. 4, *Commelyna Virginica;* No. 5, *Lespedeza violacea;* No. 6, *Hypericum Drummondii;* No. 7, *Aster Novæ Angliæ;* No. 8, *Poa compressa;* No. 9, *Panicum dichotomum;* No. 10, *Mollugo verticillata;* No. 11, *Kœleria cristata;* No. 12, *Tricuspis purpurea;* No. 14, *Eleocharis tenuis;* No. 15, *Pycnanthemum linifolium;* No. 16, *Acalypha Virginica;* No. 17, *Aster miser;* No. 18, *Aster tenuifolius;* No. 19, *Cephalanthus occidentalis;* No. 20, *Mulgedium acuminatum;* No. 21, *Lactuca Canadensis.*

H. H. Mapes, Kalamazoo, Mich.—No. 1 is the Climbing Bittersweet (*Celastrus scandens*, L.); No. 2, Ginseng (*Aralia quinquefolia*, L.); No. 3, *Penthorum sedoides*, L.; No. 4, *Hypericum corymbosum*, Muhl.; No. 5, Willow Herb (*Epilobium angustifolium*, L.); No. 6, *Aster dumosus*, L.