

Ohio Agricultural Experiment Station.

BULLETIN 86.

(SECOND EDITION.)

WOOSTER, OHIO, JULY, 1899.

THE STORY OF THE LIVES OF A BUTTERFLY AND A MOTH.

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BULLETIN

OF THE

Ohio Agricultural Experiment Station.

NUMBER 86.

[SECOND EDITION.]

JULY, 1899.

THE STORY OF THE LIVES OF A BUTTERFLY AND A
MOTH.*

BY F. M. WEBSTER.

Ever since its inception, the Experiment Station has been endeavoring to reach the farmer and fruit grower, and, if possible, afford him such information as would enable him to improve upon his methods and increase the net results of his labors.

Later, it has tried to afford him a better knowledge of the various insects, which destroyed his crops, and, where possible, point out to him the difference between friend and foe in the insect world. So far, all of these efforts have been to educate men and women; while the children, who are to be the men and women of the future, have been totally neglected.

There is probably nothing that so interests children, or excites their curiosity more than beautifully colored insects. And nothing would contribute more to excite their natural inquisitiveness than these insects, provided there were any persons able to give them satisfactory answers to their questions. The stereotyped reply, "They're only just bugs," gets dry and monotonous, even to children, and the little ones

* The first edition of 44,000 copies, of this bulletin, was exhausted within eighteen months after the manuscript was prepared, and the demands for it still continued. Very many complimentary letters have been received from all quarters of the country, coming from university professors as well as from teachers in the public schools. Not only this, but in many schools, in Ohio, the younger pupils have brought the cocoons of the *Cecropia* moth into the school-rooms, and watched the great, beautiful moths, emerge and unfold their gorgeous wings, thus affording a nature study in real life. Besides, not a few grown people, not teachers, have found a peculiar interest in the little bulletin. The good that it appears to have done seems sufficient to warrant the publication of this, the second edition, which, like the first, will be sent free to teachers, for use in their classrooms.—F. M. W.

who are thus forced to accept this answer soon come to misapply it in the same way and there the matter usually rests.

Recent efforts have been made to institute what are termed "Nature Studies" in the public schools—a very laudable movement,—but who is to give the instruction? In a majority of cases the teacher has yet to be taught, and, besides they are often confronted with the question, "Where shall I go to find out what I am to teach?" and the answer has in many cases not yet been given.

In many foreign countries the youngest pupils in the schools are taught to observe the common insects, and instruction is given by the teachers as a part of their duty and generally either by illustration or by word of mouth. Besides this there are often published short stories or anecdotes tending to encourage an interest in such studies, so that when these children grew up to manhood or womanhood, no matter how humble their lives may be, they do not forget the simple lessons taught in the school-room, but have a fixed, general idea of the things around them, which knowledge they have obtained in a most pleasing manner and almost without knowing it.

All men are not husbandmen and all children do not, and of course cannot, live in the country, but, except in the overcrowded portions of our larger cities, there are few people who are denied the garden or lawn, even though these may be limited in area, and with them are always to be found insects of various kinds. With neither garden nor lawn, there are still trees and plants and flowers in the parks, and these have their insect inhabitants, both good and bad.

Now, it would seem that if we could put into the hands of the young, and especially the school children, some short, simple, illustrated story of the lives of some of the most common and most easily seen of these insects, we would be doing for the children just what the Experiment Station has been trying to do for grown people; and if we can but instill into their juvenile minds a love for nature, it will tend to make them better men and women, whether they, later on in life, abide in the city or country. In the following pages, then, it will be the aim to present in the most simple form possible, the stories of the lives of one each of our largest and most common butterflies and moths. These have been selected on account of the very fact that they are common, and being highly colored are easily seen. However, the fact must be borne in mind that this bulletin, while intended more especially for the young, may also prove of interest to those who are older yet not familiar with insects, and to whom the more scientific bulletins are not especially interesting. Besides this, both of these insects are classed among the injurious.

A SWALLOW-TAIL BUTTERFLY.

(Pa-pil'-i-o as-ter-i-as.)

Late in the month of May there will be seen flying about and often resting upon parsley, celery, parsnips and other plants of this kind, a



f. Detmers, del.

Different stages of the Swallowtail Butterfly: *a*, egg; *b*, caterpillar; *c*, head of caterpillar; *d*, chrysalis; *e*, side view of butterfly showing underside of wing and also showing its position when laying eggs; *f*, butterfly with wings spread showing upper side.

large, black butterfly, spotted with yellow, and three or four inches across its wings. This butterfly is shown in the picture, and as it sits upon the plant it opens and closes its wings just as it is here pictured, except that the colors are black and yellow, the middle row of spots on the hind wings is bluish and the large spot on the inner edges of the hind wings is somewhat like an orange-colored eye with the outer border yellow and a black spot in the center. Butterflies of this kind are called swallow tails on account of the hind wings having a long point extending backward like the tail feathers of a swallow.

A butterfly has a knob on the end of each an-ten-na or feeler, as it is sometimes called, while a moth does not have a knob and the feelers may be either thread-like, or bushy as is shown in the picture of the moth, further on. These feelers are placed on the head somewhat like horns.

While the butterfly has been sitting upon the plant, as shown at *e* in the picture, she has placed on a leaf a delicate, light yellow egg, that is smooth and round, being slightly flattened where it is attached to the leaf. Soon after, this little egg will change color in part to reddish brown, and in from five to nine days there will hatch from it a very small caterpillar, thickly covered with bristles, nearly black, with a broad, white band across the middle, and another on the hind part of the body. It eats an enormous amount of leaves and grows quite rapidly until its skin becomes too small, when another skin is formed just under the old one, which bursts, and the young caterpillar makes its way out with a new coat.

Unlike the young of some of the other swallow tail butterflies, this one does not eat its old coat. The new coat is very much like the old one in color, but is a little larger. This, too, soon gets too small and another suit is soon needed, and grows under the old one, just as before. This last coat, besides being larger, has bright spots upon it.

But this, too, soon becomes too small and is cast away for another one; this time it is of a bright green color, with black bands, on which are placed three rows of brick-red spots on each side.

But this caterpillar has almost as many dresses as a queen, and as it keeps on getting larger it must have yet another new dress. This time it is green with black bands across the back, and on each band is a row of round, yellow spots, just as shown in the picture at *b*.

While the caterpillar has been growing so rapidly and changing its colors so often, it has been getting a pair of horns. These have not grown upon the outside of the head, as they do upon a calf, but are hidden in the neck just back of the head, and when the caterpillars are frightened these horns are pushed out. The horns are yellow and send out a sickening odor, which may serve to protect the caterpillar by driving away its enemies. These horns are shown extended with the front of the head in the picture at *c*.

Now, our caterpillar has become full grown, but it must still have another new dress, and to get this it does not go out shopping, but crawls to some object like the stem of a plant or a post and fastens its hind feet to this object by silken threads, which it makes with its mouth. After having fastened itself in this way it spins a few more threads over its back to keep it from falling down, and appears to go to sleep.

The old coat now splits and is pushed off backward, and the insect is no longer a caterpillar, but has changed to a chrys-a-lis. This does not look a bit like a caterpillar and but little like a butterfly. It is now an inch and a quarter long, of a pale green, deep buff or ash-gray color, with two short earlike humps above the head and a hump on the upper part of the back. This is shown at *d* in the picture. It has somewhat the color of weather-beaten wood or of a piece of bark, and when fastened to either of these it is not easily seen, which may serve to protect it from its enemies.

It now seems to be almost lifeless, but underneath this outer coat a butterfly is forming, and in from nine to fifteen days this coat will burst along the back and out will creep a yellow and black butterfly, but with its wings so rolled up and folded that it looks almost like a long insect without wings.

But the air soon dries the wings, and as they are unfolded, one is led to wonder how so much butterfly could be packed in so small a space. It soon gets the use of its wings and flies away to find a plant of the proper kind for its young to feed upon, when it will most likely lay its eggs upon it.

These eggs hatch and the young caterpillars grow and change their coats just as the others did until the chrys-a-lis stage is reached. But instead of coming out of the chrys-a-lis in a few days, it now passes the winter in this stage and the butterfly does not burst out until May of the next year.

Though it has been used to warm weather the little chrys-a-lis is rocked about by the wind and beaten upon by the rain and sleet and snow, but all of these cannot injure the butterfly tucked away in its snug winter home, fast asleep.

THE CECROPIA EMPEROR MOTH.

(*At-ti-cus ce-cro-pia*.)

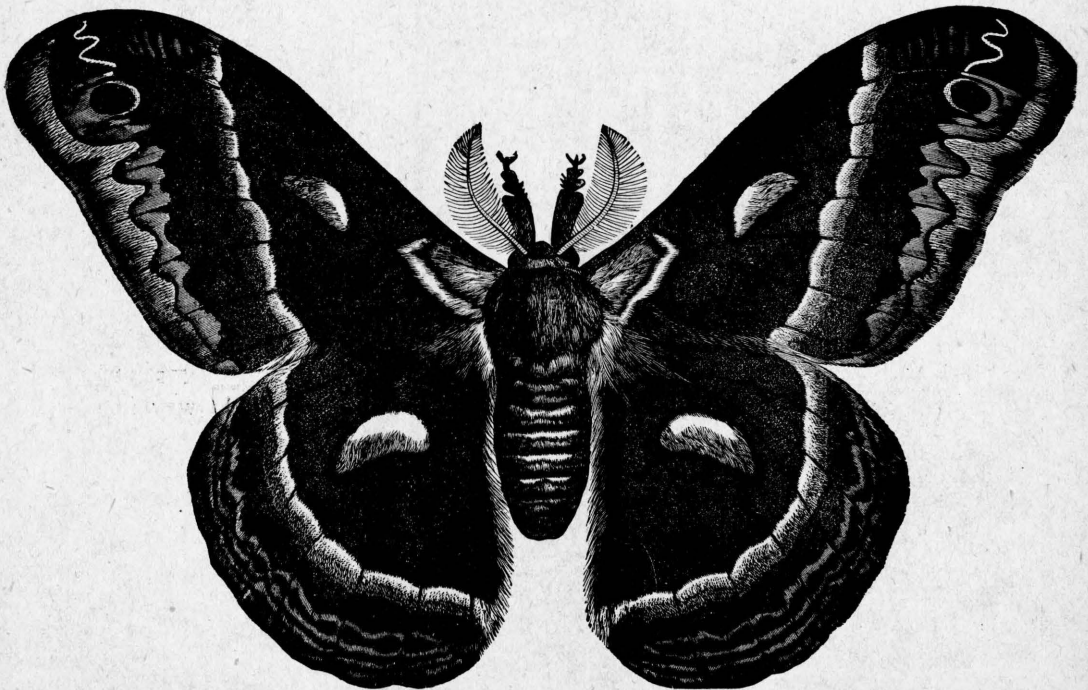
Of the many beautiful insects that are to be found in this country there are very few which excite more surprise and delight than the big Ce-cro-pia Em-per-or Moth, a picture of which is here given about natural size, as it measures, when its wings are spread, from five to seven inches from tip to tip. Its wings are mostly of a rich brown color, the front pair being grayish, shaded with red, the hind pair more brown.

and about the middle of each wing is a spot of the shape shown in the picture, white, shaded more or less with red, with the edges black. A wavy, dull red band, edged on the inside with white, crosses each of the wings.

The outer edges of the wings are pale, silky brown on which, on the front pair, runs a wavy dull black line, and on the hind wings, instead of this line is a double broken band of the same color. The upper side of the body and the legs are dull red and there is a wide band behind the head and the hinder edges of rings of the body are white and the under side of the body is also marked with white.

These moths may sometimes be noticed in late May or early June, clinging to the underside of a leaf of a tree or shrub, and upon this fastening small, dull, creamy white eggs, about one-tenth of an inch long, almost round, with a reddish spot or streak near the middle. As the mother moth has to lay from two to three hundred of these eggs, which she generally places in pairs, it takes her quite a long while to finish her work.

In a week or ten days a young caterpillar eats its way out of the egg and then eats the empty shell. It is black at first, with little,

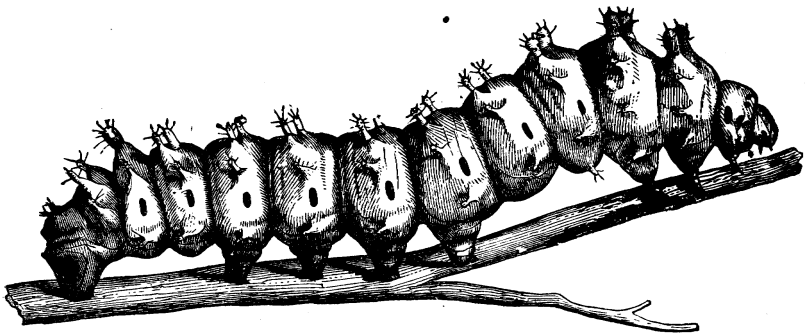


shining black knobs on its body, and from out of each knob grows a black hair.

As with the butterfly, this black coat soon begins to get too small for the young caterpillar, and it must get a new one, which simply grows over it underneath the old one, which bursts and the caterpillar comes out in an entirely new suit.

This time the body is of a deep orange color, and the black knobs now look more like warts, but they are still black like the head and there are rows of black dots along the body between them.

But this suit is soon out-grown and cast away, the next one being of a beautiful yellowish tint, and the little knobs become immense, spiny warts as shown in the picture below, which shows the full-grown caterpillar about natural size.



The very large warts on the back are colored blue, coral red and yellow, with black spines and a black spot on the inside and outside of the stem on rings 4-11; those on the sides are blue and the head is of the same color as the body.

This caterpillar does not breathe through the head, but through the small holes in the body along the side; these are shown in the picture between the warts along the sides, except on the second, third and last rings.

But there is another changing of coats, and this time the head and body are delicate bluish green, and the black spots disappear, except those below the row of warts farthest down on the side.

But there is one more change of coats, and then the caterpillar is exactly of the shape shown in the picture, measuring usually over four inches in length, and the red warts near the head have very often changed to yellow.



While this caterpillar has been growing and changing its dress it has eaten a great many leaves of whatever kind of tree it may have been on, and it will eat apple, cherry, plum, pear, willow, lilac, currant, hazel, hickory, birch, elm, honey-locust, barberry, hawthorn and elder. In a single day it may eat more than its own weight of food.

But as in the case of the butterfly all of the growing takes place in the caterpillar stage and butterflies and moths never get any larger than when they first appear.

This large, ugly-looking caterpillar now ceases to feed and crawls to the limb of a tree, or sometimes a post, and with its mouth and material therefrom, it begins to weave a silky covering almost like paper. This is much too large for the body of the caterpillar, but just beneath this outer covering it spins a great number of loose threads almost as soft as cotton, and still inside of this is a much smaller, very closely woven case, smooth and shiny on the inside. Boys and girls with sharp eyes may sometimes see the caterpillar making this covering which is fastened lengthwise to a limb, post or other object while being made and is called a co-coon, and is shown in the picture about its natural size and shape.

This is the winter home of the insect, for these moths are different from the swallow tail butterfly in that there is only one brood of young each year. About two weeks after this co-coon is finished, the caterpillar that made it changes to a large, brown chrysa-lis, and in this shape and stage the insect passes the winter. Its winter home like our houses, has an outer and inner wall, and these walls being tough serve to protect the helpless insect from many of its enemies, but not all of them. In the winter time, when the ground is covered with snow, the hairy wood-pecker gets very hungry and it finds out that there is something inside the co-coon that is good to eat. So it will creep out along a limb, and with its sharp bill or beak, make a hole through both walls of the co-coon and drink the blood of the chrysa-lis within.

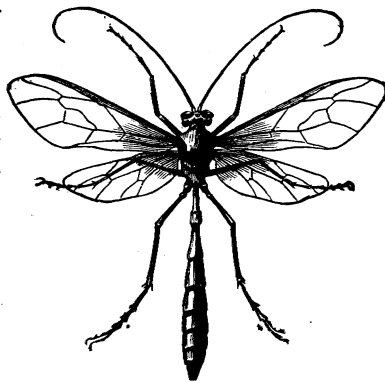
If nothing happens to this big, brown chrysa-lis in its winter home, a big Emperor moth will grow within the chrysa-lis, and in late May or early June will be ready to make its way out. But how is it to get out? If these big co-coons are gathered in late fall or winter and kept in a warm room the moths will come forth long before warm.

weather, but if the co-coons are examined very closely they will seem to be as perfect as when first brought in, but the big moth is not now on the inside, but crawling or flying about the room and the two wonders are, how so much moth could stay in such a small house, and how it could get out.

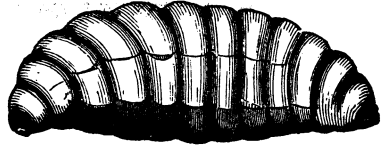
The great ugly caterpillar, when it made the co-coon, seemed to know that as a moth it would have to get out, and therefore left a door, but where is the door? If an empty co-coon is cut open lengthwise with a pair of sharp scissors, it will be found that what was the upper end of the co-coon when it was made, was very loosely spun, and the caterpillar, just before it was turned to the chrysalis, placed its head at this end of the co-coon, and when the big moth is ready to make its way out, it moistens these loose threads and pushes its way out from among them, and into the outside world.

We have stated that the only time in the whole life of the insect, during which it grew, was while it was a caterpillar, and that butterflies and moths do not grow. This does not mean that they do not eat though their mouths are very different from those of caterpillars, as these last have jaws and can gnaw leaves; but the mouth of a moth or butterfly is only a very long, slender tube, fastened beneath the head, and is coiled up just like the spring of a watch, and can only be used for sipping the nectar from flowers. Some butterflies can be caught and fed upon sweetened water, which they will sip by unwinding their long, thread-like tube, when their eating can easily be watched. Like the caterpillars, they breathe through tiny holes or slits in the sides of the body. So, while they have mouths, they do not have noses. Butterflies and moths all belong to the Lepidoptera, meaning that their wings are more or less covered with scales placed like those of a fish.

A great many of the caterpillars are probably eaten by birds, but there is another enemy, in the form of a wasp-like insect, shown about natural size in the picture. This carries underneath its body a sharp, pointed, slender, needle-like tube, looking somewhat like the sting of a bee but which is really used for laying its eggs in the bodies of caterpillars. This wasp-like insect will creep up to a large caterpillar and while standing with its face towards it, raise itself slightly on its feet and bending the slender hinder part of its body forward beneath the front portion, it quickly thrusts the needle-like tube into the body of the caterpillar, leaving a tiny egg just under the skin. This egg hatches out a little white grub, which feeds upon the flesh of the caterpillar, being careful not to touch any vital parts so as to kill



it. In this way it continues to live and grow within the body of the caterpillar until the latter has made its winter home; when, instead of turning to a chrysalis it dies, while the little white grub makes his way out, leaving nothing but the empty skin of the poor caterpillar. The grub has no feet, but is very large and fat as it is shown in the picture.



This grub now spins a cocoon of its own, which is dark brown and very closely woven. Within this, and within the cocoon that was made by the now dead caterpillar, this fat grub changes to the wasp-like insect, which makes its way out through the same door that was left by the caterpillar, so that sometimes, instead of getting a large, beautiful moth, there appears in its place one of these wasp-like insects.

Though these wasp-like insects seem to live in a very cruel way, they destroy a great many caterpillars, which would otherwise probably do a great deal of injury to trees by eating the leaves, so these last named insects are friends instead of foes, and on account of their habits are called parasites.