PSYCHE.

CHEMICAL CHANGE OF COLORATION IN BUTTERFLIES' WINGS.

BY WILLIAM HENRY EDWARDS AND JOSEPH MARTIN WILSON.

In Letters to the Editors of PSYCHE.

In coloring a proof plate for the Butterflies of N. A., the insect is enclosed in a tight shallow box, the flat sides of which are glass. When delivering the examples of *Limenitis arthemis* to the colorist, last summer, Mrs. Peart fastened in the box a bit of cotton on which was dropped a little undiluted carbolic acid (as sold by the druggists). When the colored plate was sent me for inspection, it appeared that a rich purple had been applied at every point which in the insect is metallic blue or green, and I wrote the colorist to ask for an explanation. She replied that she copied the colors of the examples furnished her. Shortly afterward, I was in Philadelphia, called on the colorist, and found that she was right. The insects were wholly changed wherever these two colors had been present, and I had to furnish other examples for copy. Of course I took care that no acid was now present.

I brought the purple examples home, and several weeks later was surprised at finding that all trace of purple had passed away and the usual colors were restored. I should be pleased to see an explanation of this. *W: H: Edwards.*

Coalburgh, W. Va., 30 April 1880.

About the first of May you sent me the enclosed letter from W: H: Edwards, asking for an explanation of the phenomenon described therein.

At the Detroit meeting of the American Association for the Advancement of Science, in 1875, Mr. George Dimmock read a paper which conclusively proved that the colors in the wings of insects are pigments. It is also well known that certain animal and vegetable coloring matters, *e. g.*, litmus, cochineal and others, are red or blue according to the character of the solution in which they are; that is, red in acid solution, blue in alkaline solution. My opinion is that the blue and green colors of the wings of *L. arthemis* are similarly affected; experiments confirm this partly but not entirely, inasmuch as strong acids turn the colors reddish and alkalies partially but not entirely restore the blue color, so that there is possibly a decomposition of the coloring matter as well as a change in color effected by the acid. Carbolic being a comparatively weak acid, is more easily neutralized; moreover, being volatile, its effects are more transient than those of the stronger acids.

I was in hopes that I might isolate the

pigment from the examples furnished by you, but as it occurs in such minute quantities I was obliged to give up that idea, and to experiment on the entire wing; this may account for my not being able to restore the blue color by means of alkalies.

Yours truly,

Joseph M. Wilson, S. B.

Charlestown, Mass.,
25 July 1880.

NOTES ON *PHOXOPTERIS ANGULIFASCIANA* ZELL.

BY CHARLES HENRY FERNALD, ORONO, ME.

On the 23d of May 1878, between one and two p. m., I saw a small Tortricid fluttering in a very peculiar manner over a patch of clover. Approaching nearer, so that I could observe more closely, I found that she was depositing her eggs on the leaves of the white clover (*Trifolium repens*).

She fluttered about on the upper side of the leaf for a little time, then standing over and in a line with the midrib, she deposited an egg on the midrib, about one-third the distance from the end. In some cases only one egg was deposited on a leaf, in others, two; but in the latter case the second egg was deposited in the same manner as the first, but at a third of the distance from the opposite end of the leaf. Having observed the manner of depositing the egg, I attempted to capture the female, but failed to do so. I therefore took up the plants into a flower pot, taking them into the house where their transformations could be observed.

The eggs were of an oval form, somewhat flattened, so as to rise but little above the surface of the leaf. The length was 0.8 mm., width 0.6 mm., thickness about 0.4 mm. Color dull grayish white, transparent at the edges; surface reticulated, as could be seen under a strong lens, with a play of colors.

The moth was not easily disturbed while depositing her eggs, and readily distinguished between the leaves of clover and sorrel, alighting several times on leaves of the latter, and as quickly flying off to another leaf, not stopping till she came to the leaves of clover.

Being called away from home at this time, I did not learn the time required for the eggs to hatch, but on my return I found that the young larvae had hatched and were feeding. They drew the edges of the leaflet up together, securing them with silk, and fed on the epidermis of the upper side of the leaflet, and on the parenchyma, leaving the epidermis of the lower side of the leaflet — now the outside of their domicil — intact, while the excrements were deposited in one end of the closed leaflet.

After having eaten all the food furnished by one leaflet, they at once left for another, going down one leafstalk and up another.

I did not have an opportunity to make a description of the larva at the time, but remember it as being dull glassy green. Early in July the moths emerged, and proved to be *Phoxopteris angulifasciana* Zell.