

SUMMER ENTOMOLOGY.*

TRAMPS AFTER MOTHS AND BUTTERFLIES.

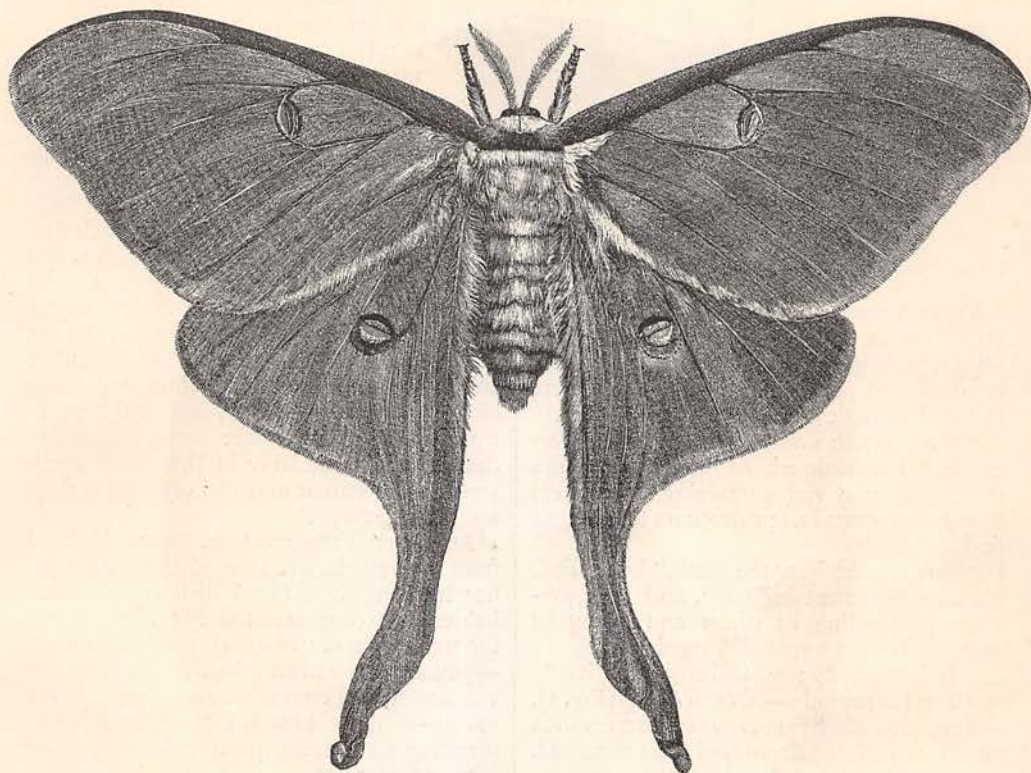


FIG. 1.—LUNA MOTH.

"WILLOWDALE!" shouted the brakeman.

Hurriedly gathering up my belongings, I alighted from the starting train almost into the arms of my old friend and college chum, Dr. Percival, at whose invitation I had come to spend a few days at his country-seat at Willowdale. We had a five-mile drive ahead of us, and consequently abundant time to ask and give all the news. Percival had forgotten none of us, and every item of information that I could give him was valued. As for himself, I gathered that his whole time was devoted to his family, to the management of his estate, and to his favorite study, entomology. On this topic the doctor was a perfect enthusiast, and I inferred from his random confessions that in all weathers he

might be found in woods or fields, in pursuit and study of insect life.

It was not long before I was reminded of Percival's hobby; for, before we had driven a third of the distance between the station and his house, he stopped the horse abruptly, and handing me the reins, jumped from the buggy, and, stepping to the fence by the roadside, removed with great tenderness and care a large moth that was resting beneath the rail.

"It's one of the finest specimens I have ever seen," he said, returning and displaying his prize.

"It certainly is a magnificent bug," I replied. "What do you call it?"

"It's not a bug, but a moth," answered Percival testily. "Remember the difference between a lepidopterous insect and a hemip-

* The beautiful illustrations of this article were drawn from freshly collected specimens by the late lamented Sonrel under the supervision of Mr. Charles L. Flint, editor of "Harris on Insects Injurious to Vegetation." The drawings were all carefully examined, criticised and approved by Professor Louis Agassiz. The engravings, which, it is admitted, have never been equaled in natural history work, were all made by Mr. Henry Marsh for the above admirable treatise, which is now published by the Orange Judd Co. of New York.

terous one. At least, don't display your ignorance to my wife, for she is well informed in these matters."

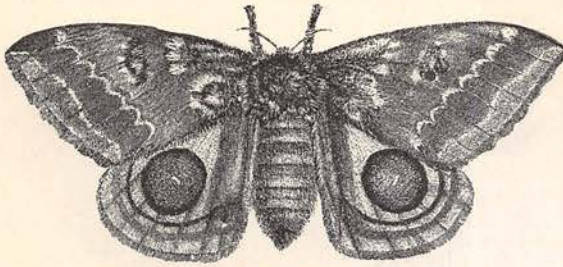


FIG. 2.—FEMALE OF THE CORN EMPEROR MOTH.

While he was speaking he opened a paneled door in the box under the seat of the buggy, took out a wooden case and, opening it, displayed a number of other insects fastened to the cork bottom of the casket.

"What in the world are you doing, Percival?" I exclaimed, as he removed the stopper from a vial containing a colorless liquid, and poured a few drops on the insect's body.

"Simply etherizing the moth," he replied. "it kills the insect instantly, and thus prevents its spoiling its wings and losing its scales. Isn't it a splendid specimen?"

"It is a beauty; what do you call it?"

"The Luna moth,—*Attacus luna*" [Fig. 1],—he replied, arranging the wings, from which hardly any of the down had been removed. "It is a female, and one of the most perfect specimens I ever captured."

The moth was about five inches wide across the extended wings, and each posterior wing was prolonged over an inch at the hind angle, so as to give the insect the appearance of being what is commonly called swallow-tailed. The color of the wings was of an exquisitely delicate pea-green, and along the front edges of the fore wings, and across the front of the thorax, was a brownish-purple stripe; the legs and outer edges of the wings were also of this color. On each of the wings near the middle, was an eye-like transparent spot which was surrounded by white, red, yellow and black rings. The body of the insect was covered with a soft white down. It was altogether a magnificent creature, and I congratulated Percival on his acquisition.

"How did it happen, Percival, that you discovered that moth hanging by the feet beneath the fence-rail? I should never have noticed it."

"That's because you are not always on

the watch for insects, as I am," replied the doctor; "it would have been strange, however, if I had not seen this one, for it was in plain sight, and it is a wonder that some marauding crow or squirrel did not find it during the day."

"I suppose these Luna moths must be quite destructive," I suggested. "Judging by the size, a few of them could make sad havoc."

"No; the injuries done by this, and one or two allied species, are quite inconsiderable; but, as a rule, the lepidoptera, in which order are included all our butterflies and moths, are among the most injurious of insects;

that is to say, they are injurious in the caterpillar form; the matured insects are quite harmless. The young of all butterflies and moths are called caterpillars, and some of them, as you well know, such as the apple-tree caterpillar and canker-worm, are terribly destructive. The larva of this Luna moth lives on the walnut and hickory, and it does no great damage."

Mrs. Percival's greeting, as we alighted from the vehicle, was as cordial as had been her husband's. After I had admired the babies, and congratulated Mrs. Percival on the possession of "two such fine specimens,"—you see, I was fast adopting the scientific vernacular,—Percival showed me to my room,—a most pleasant apartment, commanding a charming prospect of wood and lake and meadow.

"Our Willowdale air is a specific against dyspepsia," said Mrs. Percival at the tea-table, as she helped me a third time to strawberries, notwithstanding my feeble protest,— "and I advise you to fortify yourself well for to-night's hunt."

"To-night's hunt?" I asked.

"Yes; the doctor has been making some insect lures in the woods especially for your entertainment, and I suspect you will have all the fun you want."



FIG. 3.—MALE OF THE CORN EMPEROR MOTH.

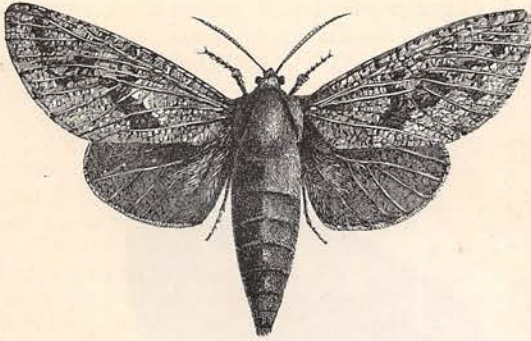


FIG. 4.—THE LOCUST-TREE CARPENTER MOTH.

I fancied I could detect in the eyes of my hostess something decidedly like merriment. The doctor, seeing that I was still puzzled, explained.

"I remembered your penchant for hunting and fishing," he said, "and I thought that a moth-hunt would be a new and interesting experience for you. So I have prepared some lures for the insects, and when it grows dark, we will see what we can capture."

"What is an insect-lure? I am quite ignorant, I confess," I said.

"It is a bait composed of sugar and ale, or sometimes of molasses and rum," replied Percival; "it is smeared over the trunks of trees in the woods; the insects are attracted by the mixture, and all through the night are constantly coming to feed, as you shall have a good chance to see."

Percival and I devoted the hours before the night came on to recalling old times and college associations.

At length he announced that it was dark enough to commence the hunt. He obtained a large lantern with a powerful reflector behind it,—such as hunters call a jack-lantern,—a gauze net for capturing insects; and a box containing all the necessary paraphernalia for securing our captives.

The night was warm, and as there was no moon, the woods, into which we soon passed, were quite dark.

"It is a capital night for our hunt," said Percival, leading the way, "and I hope you will enjoy it."

"I haven't the slightest doubt I shall," I replied, keeping close to him. "I always enjoy anything that seems like hunting, and there is evidently a promise of something exciting ahead of us."

Onward we went for quite a distance, following a cart-road that led through the woods. The lantern cut a swath out of the darkness ahead of us, and the path of intense light by contrast rendered every thing outside of it quite undistinguishable in the utter blackness.

The whip-poor-wills were repeating their plaintive songs, and the tree-toads were answering them in a harsh, wild cry. In a neighboring swamp a host of frogs were uttering their croaks and screams, and occasionally an owl flitted over us, saluting us with his diabolical cry. Numerous night-flying insects, attracted by the vivid light of our lantern, hovered about it. Occasionally, a large moth would dart into the bright space, and at length one came near enough for Percival to capture it by a quick and dexterous sweep of his net. It proved to be a female of the corn emperor moth—*Saturnia lo*, as the doctor called it. [Fig. 2.] It was a beautifully colored moth and measured about three and a half inches across the expanded wings. The fore wings were of a brownish purple, with a brown spot in the middle of each. The hind wings were purplish-brown and at the base somewhat reddish, of which color there was also a curved narrow band near the posterior edge. Within this band was another curved line of black, and in the middle of each was a large round spot of blue surrounded by a black border,



FIG. 5.—SILVER-SPOTTED HEPIOLUS.

and containing a small silver-white dash pointing to the inner angle of the wing. On the fore wings were two wavy lines running

number of purplish-red spots so arranged as to form the letters A H."

Guided by the strong light of the lantern,

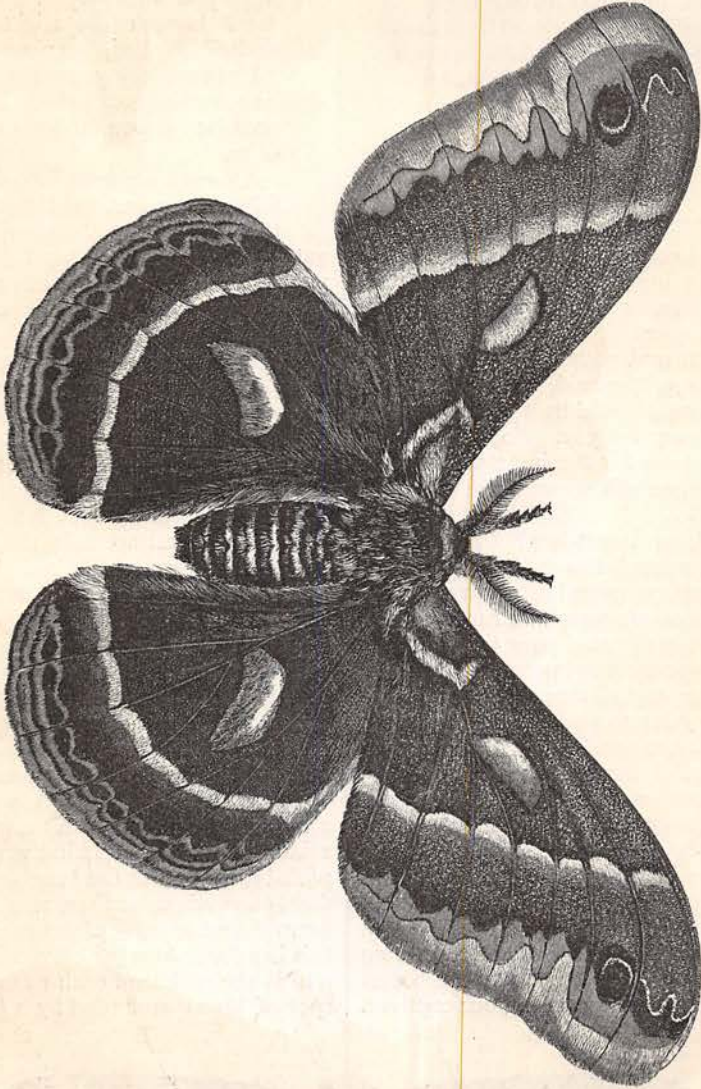


FIG. 6.—CECROPIA MOTH.

across the wing. The thorax and legs were brownish-purple, and the abdomen was of an ocher-yellow.

The doctor secured the moth in his insect case, after treating it to a dose of ether.

"It is not a rare species," he said, "but it is worth saving; the male is a much handsomer insect. [Fig. 3.] The fore wings are of deep yellow, and on each of them are a

we continued our walk. At length we stopped before one of the trees which the doctor had baited; directing the rays of the lantern upon the trunk, he examined the lure. For a short time not a moth was to be seen, although an abundance of other insects were to be *felt*, as I soon found out, the mosquitoes, attracted by the strong light of the lantern, giving us a warm welcome.

However, as "an undevout astronomer is mad," so is an unenthusiastic entomologist among mosquito stings.

"What's that, Percival?" I exclaimed suddenly, as something that I took to be a humming-bird darted suddenly with whirring wings in and out of the path of light, and around the sweet bait upon the tree. "We've wakened up the humming-birds, I verily believe."

"No, it's not a humming-bird," replied Percival, holding his net in a good position, and then with a quick motion brushing the object of our discussion into the gauzy bag. "It's a moth, one of the locust-tree carpenter moths,—*Xyleutes robinia* [Fig. 4],—so called from their habit, while in the caterpillar form, of boring into the trunks of these and other trees."

As he spoke he held the insect firmly with one hand and poured a few drops of ether on its body; then, opening the folds of the net, he exhibited to view a moth with pointed wings and body; the wings measured about three inches from tip to tip. It was of a grayish color, and the fore wings were irregularly spotted and lined with a darker color. The hind wings were much darker than the others, and near the shoulders were edged with black.

"I did not know before," said I, "that the larvæ of any of the lepidoptera bore in wood."

"Oh yes," replied Percival, "there are

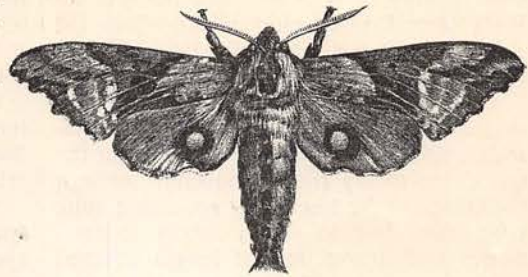


FIG. 7.—THE BLIND-EYED SMERINTHUS.

quite a number that do; some are grubs, and some true caterpillars; they bore long holes in the wood of trees, and in vines and the roots of plants. The larva of the moth that we have just captured is a true caterpillar. It bores through the trunk of the tree in different directions, making a hole in the wood which increases in size with the growth of the caterpillar. These insects are a decided nuisance to timber-growers, as they spoil many valuable trees."

"Yes," I replied, "I should think they might be great bores."

"We occasionally capture an allied species," continued the doctor, "called by Harris the silver-spotted hepiolus—*Hepiolus argenteo-maculatus*. [Fig. 5.] It is a beautiful moth; the wings are long, as is also the body; the color is ashen-gray, the fore wings are irregularly marked with spots and bands of darker gray. The hind wings are of about the same color, but are tinged with a yellowish ochre toward the tips. The veins

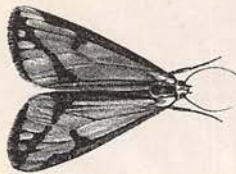


FIG. 8.—THE SOLDIER MOTH.

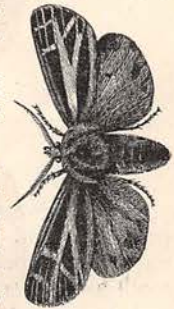


FIG. 9.—THE HARNESSED MOTH.



FIG. 10.—THE FEMALE OF THE PROMETHEUS MOTH.

show plainly in both this and the one we just captured. But stand still—don't move! I just caught a glimpse of a large moth in the trees yonder; it is drawing this way."

I stood in eager expectation, for I saw that Percival was all excitement. The immense moth, whose presence had caught the quick eye of my friend, hovered through the foliage of the trees, now appearing quite near, then lost to sight; finally it drew nearer and nearer, and at length hovered

with white. On the fore wings next to the body was a curved white band on a dull red ground. The body was covered with a soft dense down.

"Let us now visit another place," he said, turning down a side path; "perhaps we may find something else that will prove interesting."

"Go ahead, old fellow!" I exclaimed, stumbling after him. "This is fascinating sport, and a few more such beauties as you

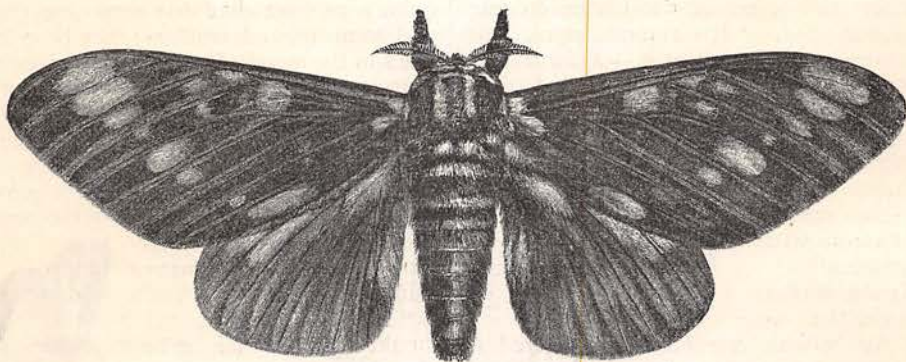


FIG. 11.—THE REGAL WALNUT MOTH.

about the sweet bait on the trunk of the tree. Percival stood still a few moments, and then launched his net and made the moth a prisoner.

A cry of astonishment escaped me as I caught the beauties of the moth, displayed as they were in the vivid light of the lantern.

"What is it?" I asked. "It is certainly one of the most beautiful creatures I ever saw."

"It is the *Cecropia* moth (*Attacus Cecropia*)" [Fig. 6], answered he, arranging the wings symmetrically; "it is one of the largest I ever saw, and a female."

It was all of six inches across the extended wings, and was a larger insect in every way than the *Luna* moth. The body on the upper side was of a reddish-brown color, and on the under side was variegated red and white; the legs were brownish red and there were a number of white rings across the abdomen. The wings were grayish dusky-brown, and the hinder margins were clay-colored; near the middle of each wing was a kidney-shaped reddish spot with a white center and a narrow black border. Near the tip of each of the fore wings was an eye-like spot, black within a bluish-white crescent. There was a wavy reddish band across each wing bordered on the inner side

have taken to-night will convert me into an ardent entomologist."

"Good!" replied the doctor mischievously; "'and while the lamp holds out to burn,' etc. I foresee a promising convert in you,—but here we are."

As he spoke, he turned the rays of the lantern upon the lure before him. A great number and variety of insects were to be seen, hovering about the bait and feeding upon it.

Percival busied himself at once, and many were the specimens he secured. Of course, it is quite impossible for me to remember even a tenth part of the varieties he captured. I can only describe some of the more striking ones.

One of the first that he caught was a quite pretty moth, which he called the blind-eyed *Smerinthus*—*Smerinthus excrucata*. [Fig. 7.] It was of a brownish-fawn color generally, with the exception of the posterior wings. These in the middle were of a delicate rose-color, and on each of them was a black spot with a pale blue center. The fore wings, when expanded, would measure about two and a half inches from tip to tip; they were spotted, with waves of a lighter fawn or gray color.

"Unlike most of the other hawk moths, or sphinges, to which group this *Smerinthus* belongs," said the doctor, "the insect in the adult or moth form probably does not take any food, its tongue being too short for use. You would be surprised to see the tongue of the potato-worm sphinx, when it is uncoiled. I have taken a specimen with a tongue between four and five inches in length, and there is a Madagascar species that has a tongue over nine inches long. These lengthened members are given the insects to explore the deepest flowers, and suck up the nectar upon which they feed. Most of the species fly with great vigor, and they poise over the flowers by the rapid motion of their wings, almost precisely like the humming-bird, and then insert the tongue into the nectaries. The insect coils it up, when it is not using it, like a watch-spring, and it is stowed away very compactly. The caterpillars of the hawk moths do not spin cocoons, as most of the other moths do; but descend into the earth when their transformation is about to occur. The pupa is naked, and in some species has an appendage like the handle of a pitcher. This *Smerinthus* has a slow flight, and moves about only at night."

Another odd-looking insect was the soldier moth—*Callimorpha militaris*. [Fig. 8.] It was a handsome species; the fore wings were white, with borders of brown and a stripe of the same color from the inner edge to the tip. The hind wings were plain white, and the body white, with the head, collar, and thighs buff-yellow. The wings were not spread when the insect was at rest, but were folded together roof-like at the body. When they were expanded, they measured about two inches from tip to tip.

A curious-looking species that Percival took in considerable numbers was what he called the harnessed moth—*Arctia phalerata*. [Fig. 9.] It was of a pale buff color; the fore wings were marked with two longitudinal stripes of black, and on each wing were four triangular spots of the same color; the sides of the body were reddish, as were also the hind wings next to the body. On each of the hind wings were several spots of black, and on the thorax (the front part of the body) were three stripes, and on the back another, of the same color. The under side of the body was also black. The wings measured about one and three-fourths inches from tip to tip.

"I always make it my business to destroy every tiger moth (as the arctians are called)

that I can," said the doctor, busying himself with his net; "for although this species and the soldier moth may not be particularly destructive, the caterpillars of most members of this group are very mischievous. The salt marsh caterpillar and fall web caterpillar are the larvæ of insects belonging to this family, and you doubtless know how destructive they are. The salt marsh caterpillar not only devours the grass of salt marshes, but even corn, beans, and garden vegetables."

Another splendid moth that we captured—I say *we*, because I had soon caught my friend's ardor, and rendered no little assistance—was the female of the Prometheus moth—*Attacus Promethea*. [Fig. 10.] It was a beautiful insect, and very much resembled the *Cecropia*, but was smaller, measuring but about three and three-fourths inches across the expanded wings. The white lines across the wings and the white spots were not so distinct as on the *Cecropia*. It had many of its characteristics, however; but its colors were generally lighter, and the markings less distinct.

"Well," at length exclaimed Percival, consulting his watch, "I think I have kept you out long enough. It is now twelve o'clock; we'll return to our other lure and see what we can find, and then for home."

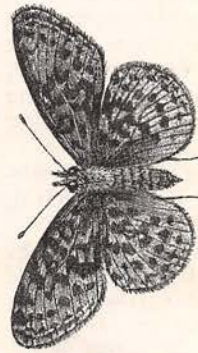


FIG. 12.—BELLONA BUTTERFLY.



FIG. 13.—BELLONA BUTTERFLY.

We trudged along the path and into the cart-road, back to the tree where he had made his earlier captures. There were numberless small moths and other insects flying about, but nothing that the doctor cared to secure, and we were just on the point of turning away, when, as I glanced upward, I discovered, flitting in and out among the foliage of the trees, what I took to be another *Cecropia* moth; but when I pointed it out to Percival, he exclaimed excitedly:

"By Jove, it is a *regalis*! Keep perfectly still! I must have him, for he is one of the rarest of our moths."

The insect fluttered back and forth through



FIG. 14.—THE CAROLINA SPHINX.

the leaves; but it appreciably drew nearer and nearer, attracted probably by the vivid light of our lantern. At last, when it flew into the open space about us, Percival made a quick swoop with his net, and the game was ours. A few drops of ether quieted its struggles, and, opening the net, the doctor exposed to view the prize of the evening, not a break nor a mar upon wing or body.

"It is the regal walnut moth,—*Cerato-campa regalis*" [Fig. 11],—said Percival, "and a perfect beauty."

The insect measured about six inches across the wings from tip to tip; but the wings being longer and narrower than



FIG. 15.—THE LARVA OF THE CAROLINA SPHINX.



FIG. 16.—PUPA OF THE CAROLINA SPHINX.

those of the *Cecropia* moth, the insect did not appear as large. The head and the upper side of the abdomen and the legs were orange-red. The thorax was yellow,

except the edge of the collar, the shoulder covers and an angular spot on the top, which were orange red. The fore wings were olive-colored, with yellow spots and veins of broad red lines. The posterior wings were orange-red, each one being marked with two large yellow patches anteriorly, and a row of olive-colored spots between the veins behind. The color was superb.

"Come home!" exclaimed Percival, dashing the perspiration from his forehead. "Come home. This is glory enough for one night."

As he spoke he led the way through the long cart-road out into the avenue, and in a short time he was bidding me "good-night" at my chamber door. It is hardly necessary to say that my sleep was profound. Let any one take such a tramp and go through as exciting a "still hunt" as we did and he *must* sleep.

On the following morning, when the breakfast-bell resounded through the house, it seemed to me that I had but just retired, but glancing at the sun I saw that the morning was well advanced.

After breakfast, the doctor and I adjourned to the piazza, and, lighting the inevitable cigar, we spent an hour of solid comfort. Percival, in order that every moment of my visit might be improved, as he expressed it, had made his plans for a raid among the diurnal lepidoptera—the butterflies, etc.; and he lost no time, certainly, for

when our cigars were finished he made preparations for the start.

As many who read this article may not know the peculiarities of the different groups of the lepidoptera (insects with four wings covered with minute scales), I venture to present their characteristics as given by Dr. Harris in his admirable treatise on "Insects Injurious to Vegetation." The three sections are distinguished as follows:



FIG. 18.—THE AMERICAN LAPPET MOTH.

"The butterflies (*Papiliones*) have thread-like antennæ, which are knobbed at the end. The fore wings in some, and all the wings in the greater number, are elevated perpendicularly and turned back to back when at rest. They have generally two little spurs on the hind legs, and they fly by day only."

An example of this group may be found in the Bellona butterfly,—*Argynnis bellona*,—two illustrations of which are given [Figs. 12, 13], one with wings spread and the other elevated perpendicularly.

"The hawk moths (sphinxes) generally have the antennæ thickened in the middle and tapering at each end, and, most often, hooked at the tip. The wings are narrow in proportion to their length, and are confined together by a bristle or bunch of stiff

hairs on the shoulder of each hind wing, which is retained by a corresponding hook on the under side of each fore wing. All the wings, when at rest, are more or less inclined like a roof, the upper ones covering the lower wings. There are two pairs of spurs on the hind legs. A few fly by day, but the greater number in the morning and evening twilight."

The Carolina sphinx—*Sphinx Carolina* [Figs. 14, 15, 16]—is a good example of this group. The illustrations given are of the perfect moth, the larva, and the pupa; the pitcher-handle-shaped appendage that I



FIG. 17.—THE RUDDELE TIGER MOTH.



FIG. 19.—VELLEDA LAPPET MOTH.

have referred to is seen on the pupa as figured.

"In the moths (*Phalænæ*), the antennæ are neither knobbed at the end nor thickened in the middle, but taper from the base to the extremity, and are either naked like a



FIG. 20.—THE TURNUS BUTTERFLY.

bristle, or are feathered on each side. The wings are confined together by bristles and

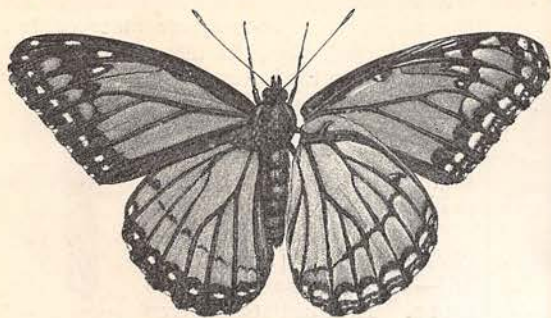


FIG. 21.—THE DISIPPE BUTTERFLY.

hooks, the first pair covering the hind wings, and are more or less sloping when at rest, and there are two pairs of spurs to the hind legs. These insects fly mostly by night."

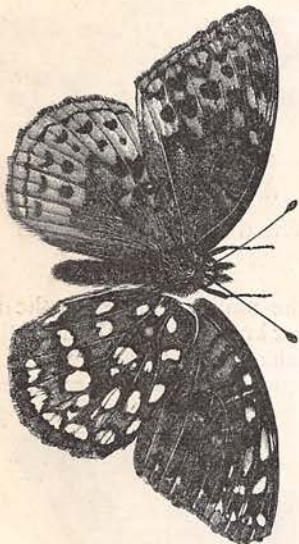


FIG. 22.—THE APHRODITE BUTTERFLY.

The Ruddle tiger moth,—*Arctia rubricosa* [Fig. 17],—the American lappet moth,—*Gastropacha Americana* [Fig. 18],—and the Velleda lappet moth,—*G. Velleda* [Fig. 19],—furnish examples of this group, in addition to those I have already described.

Mrs. Percival promised to join us at "the spring" which lay in the woods about four miles from the house, and we took up our line of march through fields and meadows, and pastures, and orchards, for our point of destination, Percival calculating that the slow progress of an entomological hunt would dispose of the five hours before luncheon.

The doctor paid no regard to the rays of the sun; he seemed to feel or know nothing of fatigue, and almost every moment of his time was employed in swinging his net, and in preparing his insects for the collecting boxes. As for myself, I took things more coolly, and looked on. Among the most beautiful of the butterflies that we caught was the Turnus butterfly—*Papilio turnus*. [Fig. 20.]* This was an elegant, graceful creature, about five inches across the wings. Its color was a lemon-yellow, the wings hav-



FIG. 24.—MIBERT'S BUTTERFLY.

ing a broad black margin in which were a row of yellow spots. The front wings had four black bands, and each posterior wing was scalloped and lengthened into a tail near which was an orange-red spot. The body was black above with a yellow stripe, which began at the neck and passed over the shoulders and along the sides of the abdomen. We saw quite a number of these butterflies hovering about pools of water. The caterpillars of this butterfly, Percival said, feed on the leaves of the apple and wild cherry trees, but do no great damage. (The doctor spared none of the more predatory species;

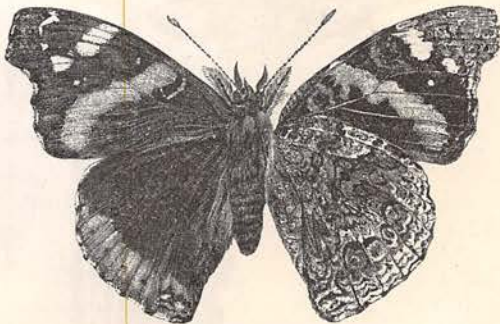


FIG. 23.—THE ATALANTA BUTTERFLY.

* In this illustration, as in a number of the others in this article, the right wing of the insect is apparently detached from the body, and of different markings from the other. It is thus arranged in order to show the markings on the under side of the wing, the left wing showing the upper side.

for he takes great pride in his farm, and worm-eaten cabbages, turnips, and radishes are unsightly objects.)

We found but a single specimen of the Disippe butterfly—*Nymphalis Disippe*. [Fig. 21.] It was a late-hatched insect, the greater number having appeared considerably earlier. It was about three and one-half inches across the expanded wings. Its color was an ochrous-yellow above and lighter beneath; the wings were bordered with black, and in this border was a row of white spots. The veins of the wings were black, and they showed strongly on the yellow ground color; on each of the fore wings near the tip was a long patch of white, and across the hind wings a narrow black band. The caterpillar of this species is not injurious to any appreciable extent, as it feeds upon the leaves of the poplar and willow.

"I cannot understand, Charlie, how it happens that you know what the caterpillars of the different butterflies and moths feed upon," said I, as I held one of his collecting-boxes for him while he secured and pinned a number of specimens that were in his net.

"Oh, the food and habits of most of the species have been ascertained by rearing the caterpillars," he replied, closing the box and continuing his tramp.

"Rearing them! How in the world do you manage that?" I asked. "I should

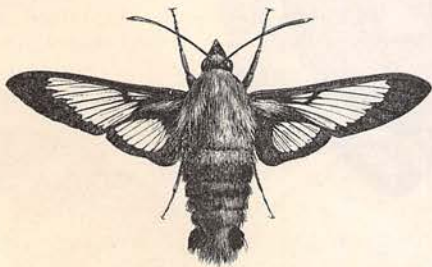


FIG. 27.—THE HUMMING-BIRD MOTH.

think it would be no end of labor to raise a lot of different kinds of caterpillars."

"It does require considerable attention, but the work is very fascinating, and it is constantly giving the entomologist interesting and valuable facts."

"I should certainly think so," I responded in a few moments when I rejoined the doctor, who had started off hurriedly for a butterfly that was fluttering from flower to flower before him, and which proved to

be the Aphrodite butterfly—*Argynnis Aphrodite*. [Fig. 22.] It was about three inches



FIG. 25.—THE IMPERIAL MOTH.

across the wings. The ground color was yellowish-ocher; the wings were marked above with a black line near the hind margins. There was a row of black crescents near this line, and a row of black spots between them and the body; there were also on the upper side of the wing a number of large irregular black spots.

On the under side of the fore wings, near the tips, were seven or eight silvery spots, and beneath the hind wings a number



FIG. 26.—OAK OR FOREST CATERPILLAR.

of silvery-white spots arranged in irregular rows.

“Whenever I find a caterpillar that is new to me,” said Percival, in reply to one of my inquiries, “I confine it in a breeding-cage, which is simply a wire frame upon which is stretched a muslin covering; or,

or keep a few twigs with their leaves on them in vials of water until the leaves are all eaten. This is continued until the first transformation. It is quite important that these breeding-cages should be kept clean

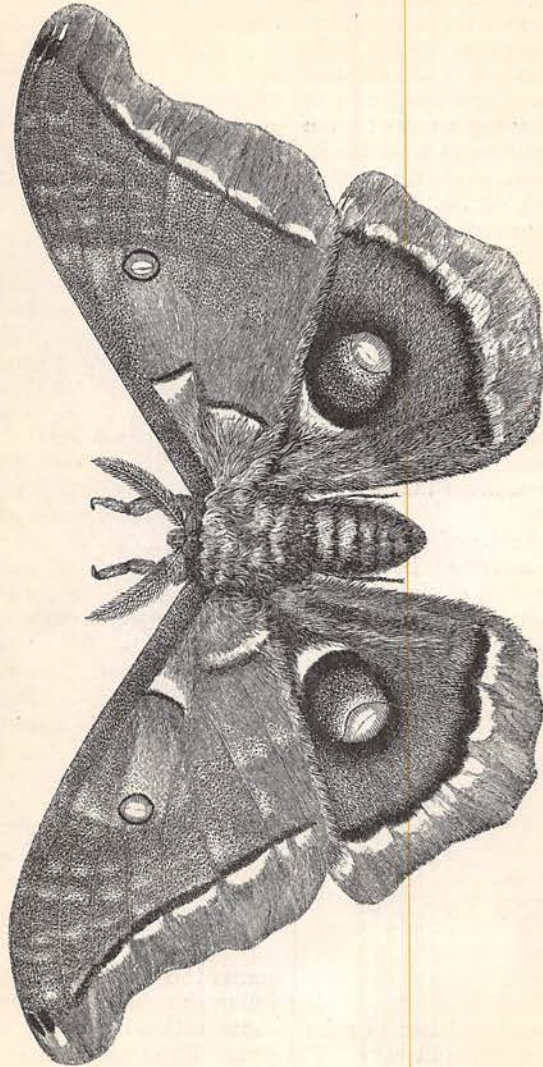


FIG. 28.—THE POLYPHEMUS MOTH.

if I have not enough breeding-cages, I use ordinary glass jars, with muslin tied over the top. In these I feed the caterpillars daily with fresh herbage of the same kind that they are feeding upon when I find them. For instance, if I obtain a new specimen upon the willow, I give it fresh willow leaves to eat every day,

and sufficiently moist. To effect this, I cover the bottom of them with damp moss, which I renew every few days.”

“What do you mean by the first transformation?” I inquired.

“The change from the caterpillar to the pupa or chrysalis form is called the first transformation, and the transition from the

pupa to the imago or perfect insect form is the second transformation."

Here the doctor gave chase to a handsome butterfly, which he called the Atalanta butterfly—*Cynthia atalanta*. [Fig. 23.] It measured across the extended wings about three inches; the wings were black on the upper side, with two or three large white spots on the anterior ones near the tips, and a band of orange-red across the middle. The hind wings had a wide band of the same color, in which was a row of small black spots; beneath, the wings were beautifully variegated and marked with indistinct spots and figures.

"The eggs are laid by the adult insects," continued the doctor, "and usually upon or near the favorite food of the species; and shortly after the eggs are laid, the parent dies, its mission having ended.

"It must be very interesting," said I when Percival had finished, "to watch all the changes of these insects. I don't wonder at your ardor in the science. There is one thing I never understood, and that is the manner in which the cocoon is spun by the caterpillar; it must be a very curious operation."

"It is," replied the doctor. "There is a small conical tube in the middle of the lower lip of the caterpillar from which the silk exudes in a sort of sticky fluid which hardens as soon as it is exposed to the air. Some species, such as the silk-worm, make a large quantity of silk, while others but very little."

"How does the moth get out of the cocoon—by gnawing out?" I inquired.

"No, the moth has no biting apparatus, although the caterpillars have strong cutting jaws. The moths and butterflies are provided with tubular tongues through which water and dew and the honey of flowers are sucked up by the insects. When the moths are ready to escape from the cocoon a peculiar acid exudes from their mouths, which acts upon the fibers of the silk, and permits the insect to burst out."

"I should think we might keep some of the more attractive ones as pets," I said after a short pause, during which Percival busied himself with fresh captures.

"That is often done," he replied. "It is a common thing for the house-cricket to be kept in a little cage by country people in the South and West, and in Massachusetts the katy-did is also kept as a pet. In Japan, as I learn from Humbert's 'Japan and the Japanese,' all the houses have cages made

of bamboo bark, constructed on elegant models, and containing large butterflies shut up on a bed of flowers; even grasshoppers are there confined in this way, and the natives take great delight in their monotonous stridulations."

During the doctor's account of the caterpillars, he caught two or three specimens of the Milbert's butterfly—*Vanessa Milberti*. [Fig. 24.] It was a neat and graceful insect, measuring about two and one-fourth inches across the expanded wings. The color above was black; near the hind margin of the wings was a broad orange-red band, and on the posterior wings was a row of pale crescent-shaped spots of blue. Near the tip of the fore wing was a small white spot, and about the middle of the wings in front were two spots of the same reddish color as the bands. The wings beneath were brown with a pale band near the edge. The caterpillars of this species live on the nettle.

During one of my halts, as I was reclining on the green turf beneath a splendid oak, while Percival was busy with his net in a neighboring meadow, I discovered one of the most interesting insects that we found during the day. I was gazing upward, lazily watching now a drifting cloud, then a bird that perched in the branches above me, anon idly following the motions of a squirrel that danced and capered on a broad limb that hung down from the trunk nearly to the ground; suddenly my eye caught what I thought was a dead leaf, hanging to the trunk of the tree, but I soon discovered it to be a large moth clinging by its feet to the rough bark. I called to Percival, telling him I had made a discovery, and that he had better hurry or the prize would vanish. He soon joined me, and upon my pointing out the insect, uttered an exclamation of delight, and in a trice the moth was fluttering in his net.

"It is the imperial moth,—*Dryocampa imperialis*,"—he exclaimed, "and a splendid specimen."

The insect was soon quieted, and I gazed with delight upon our prize. [Fig. 25.] The body was yellow, running into purple-yellow on the back. The wings, when expanded, measured about five inches from tip to tip. They were of a yellowish color, with irregular markings and spots of brownish purple; across each wing was also a band, and at each shoulder was a considerable patch of this color.

"What does the caterpillar of this species feed on?" I asked, as we left the tree.

"On the leaves of the button-wood," he replied. "It does no great mischief, for the reason that it is not at all abundant. There is an allied species, *Dryocampa senatoria*, however, the caterpillars of which [Fig. 26] often occur in great numbers on the oak, and they do great injury; they swarm together in hundreds, and sometimes completely defoliate the trees. These caterpillars are black, with four narrow yellow stripes along the back, and two on each side. They are naked, and on each ring of the body have six sharp points, or thorns, and on the top of the second ring are two which are long and slender, appearing like horns. But we must hurry; Mrs. Percival must by this time be waiting at the spring," and he hastened forward to a grove across the meadow, which was our point of rendezvous for luncheon.

At length our appetites were satisfied, and, lighting our cigars, the doctor and I displayed our captures to Mrs. Percival, who commented upon them with intelligence and enthusiasm. As the horses were being harnessed, I rambled about among the trees. On entering an open space in the grove, I found a patch of columbines, which, though it was late for them, were in full bloom. I was on the point of collecting some for Mrs. Percival, when suddenly what appeared to be a humming-bird darted among them, and poised with a humming sound above the open flowers. I called to Percival, and said:

"Last night my humming-bird proved to be a moth; but I think there is no doubt that this is a bird, for moths, you say, don't fly in the day-time."

"It is nevertheless a moth," exclaimed the doctor, seizing his net and approaching cautiously.

After dodging about after it a few minutes he succeeded in making it a prisoner.

"It is the humming-bird moth—*Sesia pelagius*," said Percival, displaying his prize. [Fig. 27.] "It is one of the few moths we have that fly in the broad daylight, even in the brightest and hottest sunshine."

The little fellow was a beauty, and one would hardly imagine it to be a moth. It was nearly two and a half inches across the wings. The color of the thorax above was brownish olive, and the body—except the two first segments, which were light purple—was purplish brown. The wings were transparent in the middle, and were bordered with brown; the breast was creamy white, and the posterior part of the body ended

with a bunch of fine hairs, like a flat brush. After we had examined the insect all we wished, the doctor allowed it to escape, and the little creature darted away like a flash.

"Well," I exclaimed, "I confess to not knowing 'a hawk from a hand-saw.' Hereafter, I'll be sure that my humming-bird has feathers before I pronounce on his identity."

During the ride home our conversation naturally ran on entomology, and Percival gave us a long and interesting account of the Chinese silk-worm.

"It is strange," I remarked when he concluded, "that we have no native silk-worms in this country. What a superb cocoon the caterpillar of the *Cecropia* moth would spin!"

"We have quite a number of silk-spinning species," replied the doctor, "and one or two of them are valuable; the others make a silk that is either too weak or of insufficient quantity, or the caterpillars are too delicate to be reared artificially. All the *Bombycidae*, of which the *Cecropia* is a good example, spin silky cocoons; there is but one, however, that is of much value. It is the Polyphemus moth—*Attacus Polyphemus*. [Fig. 28.] It is a large moth, measuring about six inches across the wings. Its color is a dull yellowish ocher shaded somewhat with black. The wings are ornamented with a transparent, eye-like spot; the spots on the fore-wings being surrounded by rings of black and yellow, and those on the hind wings by a large bluish-black spot which extends upward toward the base of the wings. The front of the thorax is traversed by a narrow grayish belt, and across the wings are two parallel bands or belts, the outer one reddish and the inner one black. It is a quite handsome moth, though not so gayly colored as the *Cecropia*. The caterpillars feed principally on the leaves of the oak, though they eat the leaves of the elm and some few other trees; they are hardy and easy to rear, and their silk is abundant and strong and of excellent quality."

"If that is the case," I said, "why does not some one go into silk culture in this country with this native species. I should think that with such an abundance of food as we have available the business might be made profitable."

"It is perfectly practicable," replied Percival, "but it is not followed to any extent here save as an amusement. Mr. Trouvelot, now of Cambridge, Mass., has given more time and attention to this matter than any one else in this country, and his investiga-

tions have given us exceedingly interesting and valuable facts. At one time he had at least a million of the worms feeding on bushes which were covered with nets to protect them from the birds; he had, as he expressed it, 'five acres of woodland swarming with caterpillar life.' The moth comes out of the cocoon in early summer, and, after mating, the female lays her eggs on the under side of the leaves. She lays several hundred and they are scattered one or two or three at a time. The worms, when first hatched, are quite small, weighing but one-twentieth of a grain; but they grow very rapidly, according to Trouvelot, eating in the fifty-six days they require to mature about three-fourths of a pound of leaves, each! The silk of the cocoon is easily manipulated, and there is no reason why we may not sometime expect to see native silk culture as a large and prosperous industry in this country.—But we are home again, and we will taboo entomology until tomorrow, or you will become tired of me and my 'bugs.'

"Not in the least," I replied, as we alighted from the carriage and entered the house. "I am a convert to your science,—an enthusiastic one, I assure you,—and I mean to keep you talking on it until I return to the city."

As many of those who read these pages may desire to collect specimens, I will give a brief description not only of the instruments that Percival took with him, but of all that ordinarily constitute an entomologist's outfit.

The nets usually employed are the sweeping net, the lepidoptera net, and the water net. The sweeping net is made of cotton cloth, which is fastened to a strong brass ring or hoop a foot or more in diameter. This ring is securely affixed to a strong handle four or five feet in length. The lepidoptera net is made of Swiss muslin or silk gauze, attached to a cloth binding that is sewed around a ring or hoop of from twelve to eighteen inches diameter across the opening. This ring is also made of strong, unannealed brass wire. The handle of this net should be five or six feet long, but light enough to be used freely with one hand. The water net is made like the sweeping net, but is constructed of grass-cloth, or other coarse material. The sweeping net is used only for beating bushes and sweeping across the tops of grass and herbage, from which the insects are brushed or shaken into the mouth

of the net. The lepidoptera net is too delicate for this rough usage, and is employed only to capture the insects while they are on the wing. The water net is used for water insects and larvæ.

The collection boxes vary in size from those small enough to be carried in the pocket of the collector to those a foot or more in width and length, which are suspended from the collector's shoulder by a strap. Any light box will answer the purpose, provided it is not less than two inches deep in the clear. On the bottom inside is glued a layer of soft sheet cork, or—better still—a layer of the pith of corn-stalks, the pins on which the insects are impaled being quite easily thrust into this material. The butterflies and moths, as soon as they have been killed by the application of a few drops of ether or refined benzine, are impaled on insect pins thrust through the thorax, and the points of the pins are then pushed into the lining of the box, and the specimens are thus kept from jostling about.

When large, heavy species are captured, they are placed temporarily for safety in triangular envelopes, the edges of which are then folded over them.

Beetles and most other insects, as soon as caught, are dropped into small bottles of alcohol, where they are kept until the collector returns home. Delicately colored species of beetles, however, should not be left long in the spirits, but should be placed in the collecting box. Beetles are impaled through the right side of the body, the pin passing through the right elytron, or wing-cover, and coming out between the second and third pair of legs. Most of the other insects, when large enough, are pinned, like the lepidoptera, through the thorax. Those which are too small to be pinned should be gummed neatly upon triangular strips of thin mica, and the pins may be passed through these strips.

The setting-board for lepidoptera, etc., is made by fastening two thin strips of pine, a foot or more in length and two inches in width, upon two uprights, which serve as supports. Between these strips is a space of about a half-inch, to receive the body of the insect, and the pin is thrust through a thin sheet of cork that is glued underneath the pine strips along the open space.

The wings of the insects are then spread out in a natural position upon the upper side of the setting-board, and are kept in place by narrow strips of card-board, through which are thrust pins into the pine to hold them.

From two to six weeks, according to the size of the insects, are required to dry the specimens thoroughly, so that they will retain the positions into which they are put. The insects are finally placed in the cabinet or exhibition-boxes, which are made in a variety of forms and styles, according to the taste of the collector. If cabinets are used, the drawers should have tight-fitting glass covers; and if boxes are employed, the covers should fit perfectly, so as to exclude the dust and small predacious insects, which devour the cabinet specimens.

The boxes and drawers should be neatly lined with sheet cork, over which should be pasted white paper; and the specimens should be arranged in rows and labeled and numbered as systematically as possible.

It is desirable that all the specimens should be pinned at a uniform height; and the more care taken in the arrangement of a collection, the more attractive it is to those who examine it. Cabinet specimens should be kept from the light as much as possible, otherwise their colors will soon fade.

THOMAS MOORE.

(MAY 28, 1879.)

A LORD of lyric song was born
 A hundred years ago to-day;
 Loved of that race that long has worn
 The shamrock for the bay!

He sung of wine, and sung of flowers,
 Of woman's smile, and woman's tear,—
 Light songs, that suit our lighter hours,
 But oh, how bright and dear!

Who will may build the epic verse,
 And, Atlas-like, its weight sustain;
 Or solemn tragedies rehearse
 In high, heroic strain.

So be it. But when all is done,
 The heart demands for happy days
 The lyrics of Anacreon,
 And Sappho's tender lays.

Soft souls with these are satisfied;
 He loved them, but exacted more,—
 For his the lash that Horace plied,
 The sword Harmodius wore!

Where art thou, Brian, and thy knights,
 So dreaded by the flying Dane?
 And thou, Con, of the Hundred Fights?
 Your spirits are not slain!

Strike for us, as ye did of yore,
 Be with us,—we shall conquer still,
 Though Irish kings are crowned no more
 On Tara's holy hill!

Perhaps he was not hero born,
 Like those he sung—Heaven only knows;
 He had the rose without the thorn,
 But he deserved the rose!