

THE LIFE HISTORY OF AN INSECT PARASITE.

BY S. FRANK AARON.

The parasites of the insect world, like those of other animal kinds, including the human, are wonderfully intelligent and absolutely remorseless; they must be so to successfully carry on their affairs. But the insect kinds, being little things and preying upon little things, do not at once impress us with a feeling of repugnance, and indeed they are so generally found to be beneficial to mankind that we must call them friends. I think that it can be safely stated that the majority of the insects attacked by parasites are noxious species.

Insect parasites are of many kinds, even the mild-mannered lepidoptera including among its numbers a few species, while the diptera, coleoptera and hemiptera possess many. It is to the hymenoptera that we turn, however, when the word parasite is used, for here are hundreds of species—the true insect parasites of insects. To this order belong the ichneumon, braconid, chalcid and proctotryped flies, stingless relatives of the wasps, all the species of which live by their wits. For the most part these most typical parasites attack the larvæ only of their victims, for by this they will most easily derive nutriment and have the time to reach development; and, too, the larvæ of the insects attacked are far more easily victimized than the hard-coated, more active and short-lived imagoes. Of the insects attacked, the lepidoptera furnish the greater number of species; indeed, it is probable that no moth or butterfly larva is without its parasitic enemy, while the coleoptera, hemiptera, diptera, and even other hymenoptera, number species commonly parasitized. To the insect thus preyed upon naturalists have applied the term "host," and the manner in which these unfortunate larvæ become tenanted by living, squirming, voracious bloodsuckers, that sap upon their vital organs and eventually kill them, is very interesting. With the parasite fly it becomes, of course, a matter of expediency, a question of room; supply and demand the chief factors. Thus we see a large, bulky larva either infested by a parasite of considerable size, or by many tiny grubs of a small species. A medium-sized ichneumon will choose for its host a larva that grows just large enough to serve the purpose of nourishing its larva, and thus, generation succeeding generation, the parasite will remain true to its host, though no doubt, if the host could be consulted, it would wish its admirers should prove more fickle.

One of the daintiest of our common insects is the pretty little collared grapevine moth, *Harrisina Americana*, formerly included in the genus *Procris*. This moth is deep bluish-black, the only touch of bright color an orange or vermilion band or collar surmounting the thorax, and it is a surprise to discover that its caterpillar is bright yellow, with only small brown or black spots distributed, ring-like, on each segment. Grapevines are its most common habitat, and feeding in small colonies, each being the hatching of one batch of eggs, and each caterpillar being possessed with the usual caterpillar appetite, it is very natural to find some portion of the vine with its leaves rapidly disappearing, one by one. Indeed, were it not for our friends the wren and the parasite, our grapevines would soon practically cease to exist. And as efficient as the admirable little wren is, I believe the parasite plays the more important part. So successfully warred upon are these pretty little pests that it is doubtful if any large vine supports an average of more than half a dozen caterpillars of *Procris* that reach maturity.

Naturalists have many ways of naming species. Here they have called a parasitic insect after the later generic name of its host. Thus a small braconid fly, pale yellow in color, with large black eyes, the individual parasite of the grapevine moth, has been given specifically the later generic name of its host, *Rhogas harrisina*. It seems almost like benefits forgot to load the brief existence of this most useful insect with such a name, and, as with most insects, there has been no common name supplied with which to more familiarly label it. So the generic name must serve, as with *Procris*.

Decidedly the most interesting part of the tragedy between *Rhogas* and *Procris* is the beginning of it, when, after the female of the former, with unerring instinct, has hunted diligently for the larva of the latter, she happens upon a colony of her victims. Back and forth she has searched, under and above each leaf, walking excitedly as if on springs, her long

antennæ incessantly twitching and touching the leaves; flying from leaf to leaf and exploring with a thoroughness that would do a trained bird dog credit. She makes straight for her game when found and proceeds at once to business. To prove she has come



PARASITIZED CATERPILLAR OF PROCRIS, SHOWING LARVA OF RHOGAS WITHIN. (Enlarged.)

upon those of the right breed, her powerful scent organs, the antennæ, with seemingly caressing touches, inspect the caterpillars, which in turn at once show alarm, swinging their heads from side to side, as a means of repelling attack. But such means are vain. Straddling the first lowly caterpillar, with her still-like legs reaching too far out on each side for interference, *Rhogas* curls her flexible, segmented abdomen downward and forward and thrusts her keen sword-like ovipositor deep into the squirming victim, and upon the instant a minute egg is forced through the ovipositor and under the skin of the caterpillar. The ovipositor is then withdrawn and the fly seeks another victim close by, repeating the operation till her egg supply is exhausted, having perhaps parasitized

a dozen or twenty worms, in one or more colonies. But these sword thrusts of the ovipositor do not kill the caterpillar outright, nor of themselves result in death. Nature's little plan would here miscarry if such were the case. The victims go right on living healthfully for a time. But when the eggs are hatched, each caterpillar becomes the host of a tiny white grub with

caterpillar host would have passed into before becoming a moth, had it lived, is with the hymenoptera of short duration, and in six or ten days, the weather being warm, another perfect *Rhogas*, transformed from the grub, cuts open a little flap in the dried caterpillar skin, emerges, and presently flies away to find and parasitize other *Procris* caterpillars.

Thus we have observed one of the most wonderful acts in nature, a life endowed with the very extravagance of cruelty, that seems at first almost uncompensating, for the mother parasite never sees her offspring, indeed it is reasonably certain that she knows nothing about their existence, but with an instinct resulting from a very high development she goes about preparing for their welfare.

The Chemistry of Soil.

"Undoubtedly one of the most wonderful discoveries of modern chemistry has to do with the soil," says *The Saturday Evening Post*. "It has been ascertained that the most barren land can be made rich simply by adding to it certain mineral elements which cost but little. On this basis it is estimated that the United States will be able eventually to maintain 500,000,000 people—more than one-third of the present population of the world. It is merely a question of supplying the requisite quantities of nitrogen, phosphoric acid and potash. The last two are readily obtainable at small expense, whereas the first may be supplied either by furnishing to the soil condensed nitrogen in the shape of slaughter waste or nitrate of soda or by planting clover, beans or peas, which have an affinity for nitrogen and absorb it from the atmosphere. It is now known that nitrogen is the most important plant food, and, inasmuch as this element composes four-fifths of the atmosphere, the question is merely to absorb it into the soil. It has also come to be understood that only 2 per cent of the material of plants is derived from the soil, the remaining 98 per cent being drawn from the air and from water."

Improvements in the Holy Land.

It has often been stated that if one of the Prophets had returned to the field of his labors, he would have had little difficulty in recognizing the old scenes, but now matters are decidedly changed. The railway from Joppa to Jerusalem is now on a paying basis, and other lines which will connect it with points of interest up and down the valley of the Jordan have been projected or are actually in course of building. In Jerusalem there are electric lights, telephones, phonographs, modern stores and sanitary plumbing; in fact, all the comforts of civilized life can now be obtained. Trolley lines are projected to connect Jerusalem with Bethany, Bethlehem, the Lake of Galilee, Samaria, Jericho, Nazareth and other places. Recently an American salesman went to Jerusalem and Beirut and sold modern merchandise to the amount of \$3,800. It is thought that in a few years the Holy Land will be a good consumer of flour. More

than two hundred phonographs were recently sent to Jerusalem, Damascus and nearby places, the Moslems buying them largely for their harems. There seems to be a considerable opening for windmills and irrigating machinery in the East. The Sultan appears to be favorably disposed toward the modernizing of this part of his dominions.

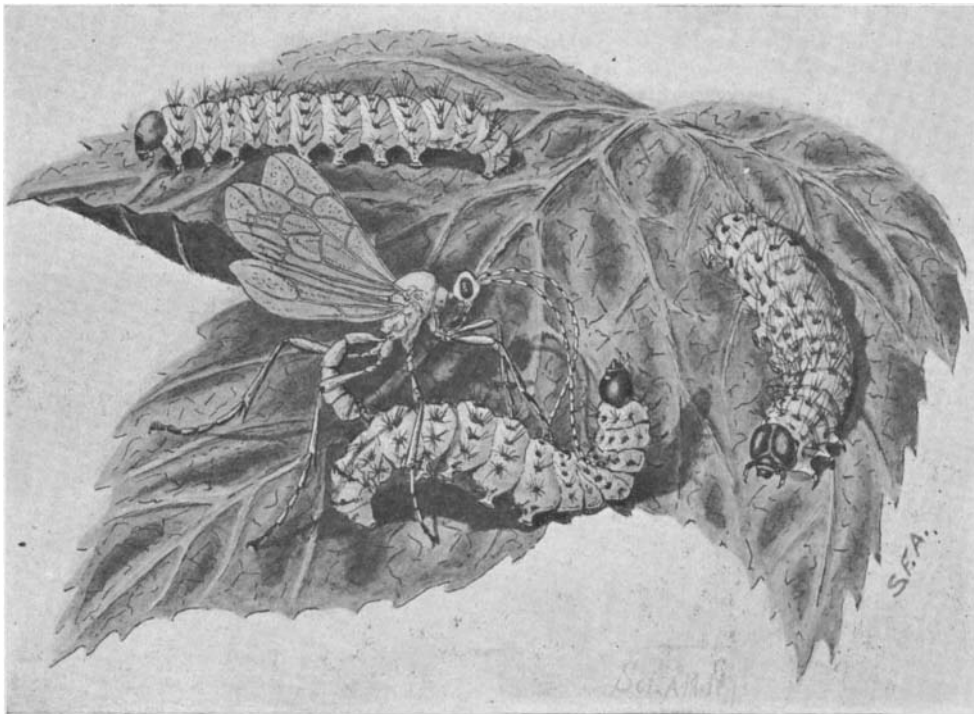
The Current Supplement.

The current SUPPLEMENT No. 1329 is filled with most interesting subjects, the first article being "Science and Agricultural Experiments," which describes the remarkable work which our experiment stations are doing. "Kondeland in German East Africa" is accompanied by a number of engravings. "Syntonic Wireless Telegraphy" is by Signor Marconi. "Protection of Ferric Structures," by M. P. Wood, is a most valuable paper, and is referred to elsewhere.

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RHOGAS ATTACKING CATERPILLAR OF PROCRIS. (Enlarged.)

a truly terrible appetite. This is the larva of the *Rhogas*. The grub feeds and rapidly grows upon the vital juices of its host. The caterpillar continues to feed also, furnishing its tenant with food. But as the parasite grows the poor host loses its activity, soon scarcely moves, and finally, its insides having been almost entirely devoured, it perishes miserably. By this time the larva of *Rhogas* is full grown and is ready to pass into the next, or pupa, stage of its existence, intermediate between the grub and the per-



COLLARED GRAPEVINE MOTH. (Enlarged.)

fect insect, and finding the hollow skin of the caterpillar a fit habitation it remains in its place, the stiff dry skin becoming its cocoon. In addition, before changing, it spins a thin silken lining that serves to strengthen the walls of its domicile. This pupal life, analogous to the chrysalis stage that the poor