CHAPTER XXII.

TRUE GUESTS, ECTO- AND ENTOPARASITES.

"Es gibt wohl wenige Gebiete der Zoologie, wo Morphologie und Biologie sich so nahe berühren, so innig durchdringen und sich gegenseitig so ergänzen wie hier: die Biologie erschliesst erst das volle Verständniss der betreffenden morphologischen Charaktere, und andererseits lassen die morphologischen Charaktere uns oft bereits die Biologie jener Wesen vorauserkennen und geben uns die wichtigsten Winke für die Erforschung derselben."—Wasmann, "Die Myrmekophilen und Termitophilen," 1896.

The persecuted and tolerated guests described in the last chapter are merely the plebeian precursors of the aristocracy among the myrmecophiles, the 300 or 400 true guests, which are no longer content to be treated with animosity or indifference, but have acquired more intimate and even friendly relations with the ants. These true guests are not, therefore, to be found skulking in the unfrequented galleries of the nest, or suspiciously dodging about among the ants, but live in their very midst with an air of calm assurance, if not of proprietorship. As a rule, they have abandoned such indefinite or panmyrmecophilous attachments as those of the synœketes and have settled down to associations with particular host species or genera. The ants, however, still remain the passively exploited partners of the alliance; they become, in fact, only the more easily mulcted and despoiled as the symbiotic intimacy increases, till, in some cases, they seem to be suffering from a social obsession or disease like the alcoholism of human communities. It is but a step from these true guests, or symphiles, to the parasites in the restricted sense. Some have regarded the symphiles, like the synechthrans and the synœketes, as parasites on the ant colony, in contradistinction to the ecto- and entoparasites, which exploit the individual ant or ant larva, but this, as we shall see, is a somewhat artificial distinction.

The Symphiles.—These are very largely beetles, and though they belong to many different families, they show a remarkable adaptive convergence, for in order to solicit food from the ants and ingratiate themselves by means of peculiar exudations, they have developed the following peculiarities in coloration, in the structure of glands, mouthparts and antennæ:

1. *Symphilic Coloration.*—Wasmann has called attention to the peculiar red color and oily surface characteristic of many true guests.

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Ants the text.

ceous animals, for in both cases the victimized species exists at the present time only because it has great reproductive powers or a margin of redundant vitality which can be exploited by its enemies and parasites; and the survival of these enemies and parasites themselves in turn depends on their refraining from overstepping this margin. In the case of *sanguinea* the enormous reproductive powers of the species must more than compensate for the destruction of colonies by the *Lomechusa*.

Ectoparasites.—With the Lomechusini we may close our account of the true guests, although these include also several other interesting forms, like *Lomechon* among the Silphidæ, *Amorphocephalus* among the Brenthidæ and *Pogonoxenus* among the Tenebrionidæ. Turning to the parasites proper, we find it impossible to draw a hard and fast line between symphiles and ectoparasites, owing to the existence of such intermediate forms as *Thorictus, Antennophorus* and *Orasema*. The group of ectoparasites as a whole is a heterogeneous assemblage of mites, Hymenoptera, Diptera and Coleoptera. The Coleoptera, however, are represented only by certain species of *Thorictus*.

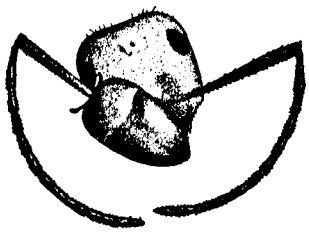

FIG. 248. *Thorictus foreli* in its normal position, attached by means of its jaws to the antennal scape of *Myrmecocystus megalocola*. (Original.)

Some of the ectoparasites, of which the Phorid flies of the genus *Metopina* and the Gamasid mites of the genus *Antennophorus* may be taken as interesting examples, are hardly more than commensals. In two papers (1901*e*, 1907*a*) I have described the singular habits of *Metopina pachycondylæ*, which lives in *Pachycondyla harpax* colonies in Texas. Its small larva clings to the necks of the ant-larva by means of a sucker-like posterior end and encircles its host like a collar (Fig. 243). Whenever the ant-larva is fed by the workers with pieces of insect placed on its trough-like ventral surface, within reach of its mouth-parts, the larval *Metopina* uncoils its body and partakes of the feast; and when the ant-larva spins its cocoon it also encloses the *Metopina* larva within the silken web. The commensal, however, moves to the caudal end of its host and forms a small, flattened puparium which is applied to the wall of the cocoon. This is obviously an adaptation for preventing injury from the jaws of the worker ants when the cocoon is being opened and the callow extracted from its anterior end. The ant hatches before the *Metopina* and the empty cocoon with the puparium concealed in its posterior pole is carried to the refuse heap. There the fly emerges and escapes from the cocoon by the opening through

which its host emerged. The *Metopina* larva consumes so little food and is so considerate of its host, that it can hardly be said to produce any injurious effect on the colony; at any rate, the larvæ which have borne commensals develop into perfectly normal workers. The ants

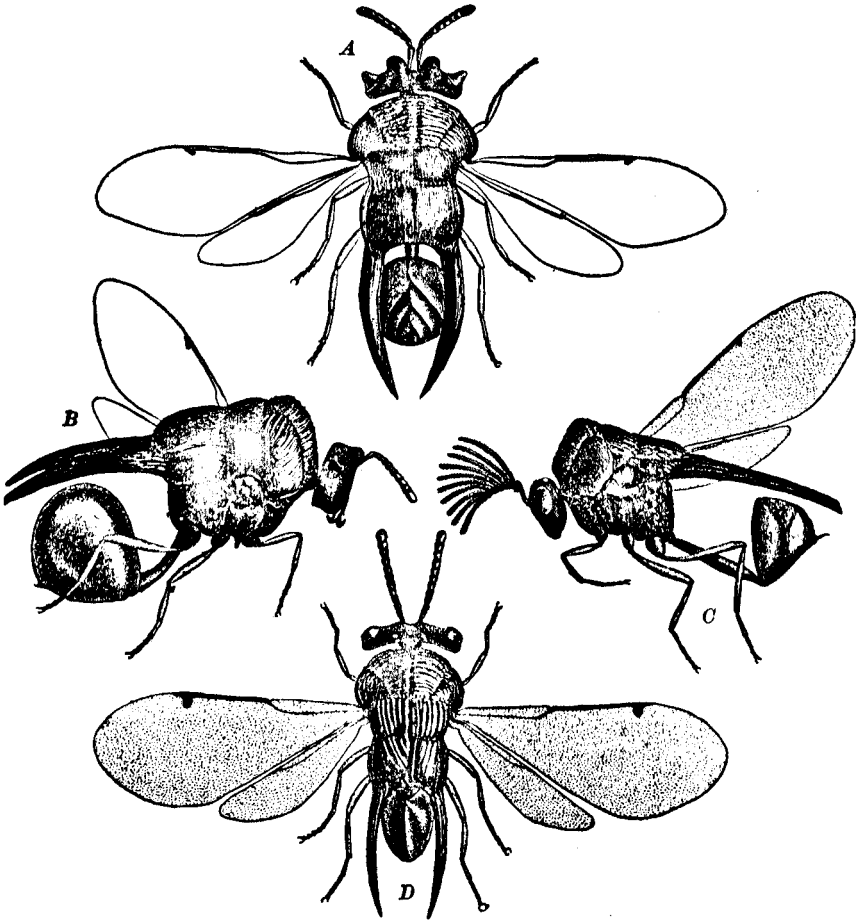

FIG. 249. Chalcidid ant parasites. (Original.) *A, Isomeralia coronata,* female; *B,* lateral view of same; *C, Kapala floridana,* male; *D,* female of same.

clean the commensals while they are cleaning their own progeny and show no signs of even being aware of their presence in the nest.

Another case of commensalism is that of the European *Antennophorus* species (*A. uhlmanni, pubescens, foreli* and *grandis*), studied by Janet (1897*b*), Wasmann (1902*j*) and Karawaiew (1905*c*, 1906*a*). These mites occur only in the nests of *Lasius* and cling to the workers

by means of their three posterior pairs of legs while the large fore pair is stretched out and moved about like antennæ. Janet found that these creatures, whether present in odd or even numbers, are always oriented in a symmetrical position with respect to their host (Fig. 244). When only one *Antennophorus* is present, it clings to the gula, or ventral surface of the ant's head, with its fore legs directed towards the ant's mouthparts. When two are present, there is one on each side of the

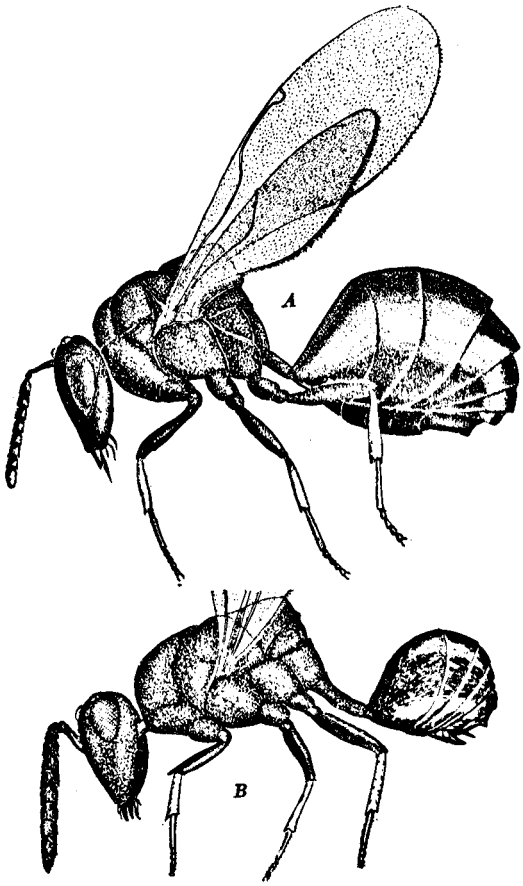

FIG. 250. *Orasema viridis.* (Original.) *A*, Female; *B*, male.

head or one on each side of the gaster; in the former case the antenniform appendages are directed towards the anterior, in the latter towards the posterior end of the ant's body. When there are three mites, one attaches itself to the gula and the two others to the sides of the gaster. Four place themselves in pairs on the sides of the head and gaster. If

six are present, which rarely happens, four are arranged in pairs on the sides of the head and gaster, while of the two remaining individuals, one attaches itself to the gula, the other to the mid-dorsal surface of the gaster. Janet believes that these symmetrical arrangements are for the purpose of balancing the burden and thus making it easier for the ants to carry. When attached to the head the mite obtains its food by drinking from the regurgitated droplet as it is being passed to or from

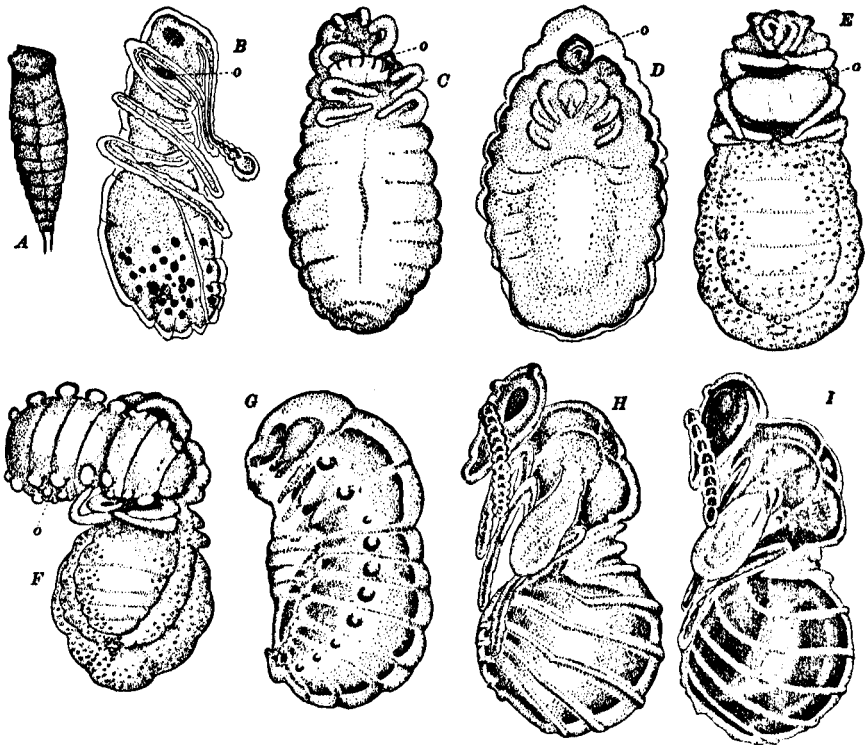

FIG. 251. Development of *Orasema viridis*. (Original.) *A*, First larval stage of *Orasema*. *B*, pupal worker of *Pheidole instabilis* with *Orasema* larva (*o*) attached to side of neck; *C*, female *Pheidole* pupa with somewhat older *Orasema* larva (*o*) attached in sternal region; *D*, female *Pheidole* pupa with *Orasema* larva (*o*) in same stage as in preceding figure, attached behind head; *E*, female *Pheidole* pupa (phthisogyne) with older *Orasema* larva (*o*) in sternal region; *F*, *Orasema* larva (*o*) beginning to pupate, with vesiculate knobs on its surface; *G*, *Orasema* pupa fallen from its host and developing within the vesiculate skin; *H*, fully formed pupa; *I*, pupa pigmented and ready to hatch.

the mouthparts of the host, or it titillates the ant with its antenniform legs and induces her to regurgitate for its special benefit. The mites attached to the gaster obtain their food by stroking other ants in the vicinity or by reaching out and partaking of the droplets as they pass

from one ant to another. The ants try to rid themselves of the parasites when these first attach themselves, but after they have taken up their definitive, symmetrical positions, they seem to be tolerated with indifference. There is nothing to indicate that the ants, while cleaning one another, are even aware of the existence of the parasites. The relations of the allied American ectoparasitic mites to their host ants have not yet been studied. *Echinomegistus wheeleri* (Fig. 245, *A* and *B*), which occurs on *Lasius aphidicola,* is probably very similar to *Antennophorus* in its habits.[1]

The number of mites living in the nests or on the surfaces of ants seems to be very great. Berlese, in a recent work (1904) has described more than sixty species of myrmecophilous Gamasidæ alone. The habits of a few of these have been studied by Janet and Wasmann and may be very briefly described. *Cillibano* [*Discopoma*] *comata* is a peculiar tortoise-shaped mite which attaches itself to the workers of *Lasius mixtus* and its larvæ (Fig. 246). On the ants it always assumes a definite position. According to Janet, when only one is present, it places itself on the side of the second gastric segment. If there are two, they place themselves symmetrically, one on each side. If there is a third, it is attached in the mid-dorsal line of the same segment. Rarely as many as six may be present; in which case there are three also on the third gastric segment in positions corresponding to those on the second. The ants dislike the *Cillibano* and tear them to pieces whenever they can seize them. The mites, however, usually slip out of their mandibles or apply the edges of their bodies so closely to the surfaces of the ants that they cannot be picked off. From scars (Fig. 246, *B, C, n*) left on the intersegmental membranes of the ant's gaster Janet infers that the *Cillibano* sucks the blood of its host. The types of another *Cillibano* (*C. hirticoma*), with long, flexuous dorsal hairs, were found by me in Texas on an *Eciton schmitti* queen (Figs. 147, *c*; 245, *C, D*). This mite attaches itself not only to the body, but also to the antennæ and legs of its host.

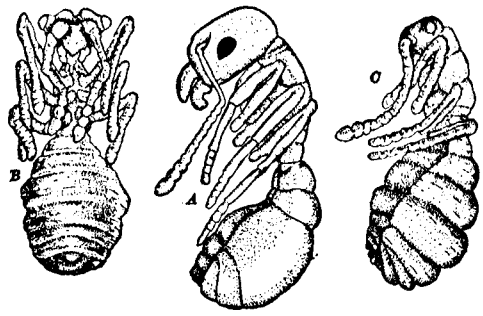

FIG. 252. *A*, Normal pupa of *Pheidole instabilis* worker; *B*, and *C*, phthisergates, produced by parasitism of *Orasema viridis* larvæ on the larvæ of the same ant. (Original.)

[1] I have recently found an undescribed species of *Antennophorus* on our North American *Acanthomyops interjectus.*