

- 7.—First segment of abdomen entirely yellow..... 8
 First segment black at base..... 9
- 8.—Following segments yellow and ferruginous..... *mirandus* Cr.
 Following segments with basal black band, widest on segments
 2 and 3.....*concinus* Cr.
- 9.—With yellow spot at side of apex..... *laticinctus* Cr.
 With broad yellow or white band at apex..... 10
- 10.—Scutellum white, legs marked with black.....*robustus* Cr.
 Scutellum yellow, legs rufous.....*rufipes* Cr.
 Scutellum black at base..... 11
- 11.—Second segment black with lateral yellow spots.....*edwardsii* Cr.
 Second segment with yellow band at apex.....*rileyi* n. sp.
- 12.—Second, third and fourth segments of abdomen rufous.....
**terminalis* Ashm.
 Second and third segments black, marked with yellow..... 13
- 13.—Stigma fuscous, first segment with broad yellow band at apex.....
pollinctorius Say
 Stigma yellow, first segment with two yellow spots at apex.....
xanthostigma Ashm.

Mr. Howard read the following paper :

THE HABITS OF PACHYNEURON.

BY L. O. HOWARD.

Pachyneuron is a genus of hymenopterous parasites of the family *Chalcididae*, sub-family *Pteromalinae*, and tribe *Sphégi-gastrides*. It is composed of small species, all under 3 mm. in length, of metallic colors—usually rather dull—large heads, flat, oval abdomens, and not very active habit. Six European and six North American species have been described. Three of the six European species were described from captured specimens, and nothing is known of their habits. Of the other three Bouché evidently reared his *P. aphidis* from some plant-louse; Ratzeburg says of his *P. coccorum*: "1 ♀ from

*This species is certainly wrongly referred to the genus *Metopius*. In addition to the fact, noted by Mr. Ashmead, that the facial shield is entirely wanting, it differs from the genus in venation—the areolet being small, triangular and petiolate instead of large and rhomboidal—and also in character of thorax and abdomen. The scutellum approaches that of *Metopius* but is longer and narrower than in any described species known to me. This insect may be referred to the genus *Tryphon*, with which it agrees in every particular except that the metathoracic spiracles are slightly oval instead of round.

Herr Reissig, who reared it with *Encyrtusæneus*, from Coccus. Later I reared a male from *Chermes piceæ*"; and of the third, Foerster says: "I have reared it from a plant-louse—a *Pemphigus*—and Herr v. Heyden, at Frankfort, reared it most probably from the same plant-louse on *Pinus sylvestris*." This is all the information we get from European entomologists on the habits of *Pachyneuron*.

The genus was first recognized in this country when I found it in 1884 among some parasites reared by Mr. Hubbard, at Crescent City, Florida, during his work on orange insects. This species, which I described as *P. anthomyiæ* in Mr. Hub-



FIG. 6.—*Pachyneuron micans* Howard. Female—enlarged.

bard's Report on Orange Insects, was reared from the puparium of a dipterous insect, the larva of which fed upon *Aphis citrulli*, and which Dr. Williston was unable to determine as other than a probable new genus of *Anthomyiidae*. (It is figured and described on page 185 of the report just mentioned). Mr. Hubbard kept the puparium of the fly, with the hole from which the *Pachyneuron* had emerged, and there was not the slightest doubt of the accuracy of the observation.

A few months later Prof. A. J. Cook sent me another species, which he wrote he had reared from a bark-louse on Blue Ash. For this I sent him the MS. name *P. altiscuta* (which he used in his next published report), and (having Mr. Hubbard's experience in mind) I asked him whether there had not been syrphid larvæ among his bark-lice, and whether this parasite might not have come from such a syrphid rather than from the coccid. He replied that there were syrphid larvæ among the lice, but that he thought the parasite had issued from the latter.

Soon after other material of Mr. Hubbard's came to my notice, and another species of *Pachyneuron* was found, which

had issued in large numbers from the puparia of *Baccha babista*, a syrphus-fly whose large larvæ he had found feeding also on the Orange Aphis. Another series he had reared from the large puparia of another *Baccha*, the larvæ of which had fed upon the Cotton Aphis (*A. gossypii*), and naturally both of these instances only confirmed my suspicions that Prof. Cook's species had come from syrphid larvæ and not from bark-lice. The idea was becoming fixed in my mind that *Pachyneuron* is normally a parasite of dipterous larvæ of the family Syrphidæ and its close allies, my experience with other groups of Chalcididæ having apparently shown me that speedy generalizations of this particular character are not rash.

Subsequent developments, however, speedily proved that no such absolute rule could be founded, and that, while the parasitism of *Pachyneuron* is not of the miscellaneous or heterogeneous character found with *Pteromalus* or *Eupelmus*, species of each of which have been bred from hosts of four or five different orders, the former from larvæ and pupæ, and the latter from eggs, larvæ and pupæ of many widely differing insects, yet it is also not of a uniform, unvaried character. It may be said, in fact, to be of a *dual* nature, its species attacking, apparently indiscriminately, insects of two entirely distinct and well-defined groups, each belonging to a distinct order, and, curiously enough, and very unfortunately for the economic reputation of *Pachyneuron*, these two classes of hosts partake of the mutual relation of prey and predator—injurious insects and their direct and peculiar enemies—thus counterbalancing the benefits which our parasites might have produced had their tastes restricted them to the former class. Such instances have been very rare in my experience, and I only recall one other in the case of *Elasmus*, which attacks both microlepidopterous larvæ and the Microgasters which parasitize them. These two classes of the host-insects of *Pachyneuron* are, first, the closely-related homopterous families *Coccidæ*, *Aphididæ* and *Psyllidæ*, and second, their predatory dipterous enemies the *Syrphidæ* and (in one instance) *Anthomyiidæ*. When infesting *Aphididæ*, in no case has more than one parasite issued from a single plant-louse, but in the case of Mr. Hubbard's anthomyiid two specimens emerged from the host puparium, while with the large *Baccha*, according to Mr. Hubbard's published statement, the parasites "issue from the puparium in numbers varying from six to eighteen, through a number of small holes which they gnaw through its top and sides." A glance at the specimens, however, contradicts the latter portion of this statement, for there is but one hole

in each puparium, all of the parasites which have issued (and there are as many as nine in some cases) having utilized the orifice made by one hard-working individual.

The extended list which follows (extended in view of the paucity of our previous knowledge) Dr. Riley has permitted me to draw up from the National Museum collection, recently rearranged at his direction by Mr. Ashmead, and it is safe to say that there nowhere exists a collection of Microhymenoptera which exhibits such a wealth of bred forms. Collected specimens are also present which, from their labels, indicate that the species fly from February to October, while such notes as are at hand indicate that they are rapid breeders.

THE HOST-INSECTS OF PACHYNEURON IN THE UNITED STATES.

ON PSYLLIDÆ.

Pachyneuron sp. From Psyllid on Arbutus (undetermined); reared by Koebele, at San Mateo, Cal.

ON COCCIDÆ.

Pachyneuron altiscuta Howard. From Coccid on Blue Ash; reared by A. J. Cook, at Agricultural College, Mich.

Pachyneuron sp. From *Kermes gallæformis* Riley; reared at Washington, D. C.

Pachyneuron sp. From *Dactylopius citri* Boisd.; reared at Washington, D. C.

ON APHIDIDÆ.

Pachyneuron sp. From *Aphis pruni*; reared by H. Osborn, at Ames, Iowa.

Pachyneuron sp. From *Siphonophora viticola*; reared at Washington, D. C.

Pachyneuron micans Howard. From *Siphonophora avenæ*; reared at Lafayette, Ind., by Webster.

Pachyneuron micans Howard. From *Toxoptera graminum*, from Tennessee; reared at Washington, D. C.

Pachyneuron aphidivora Ashmead. From *Aphis brassicæ*; reared by Ashmead at Jacksonville, Fla.

Pachyneuron sp. From *Chaitophorus* on Populus; reared at Washington, D. C.

Pachyneuron sp. From *Phylloxera vastatrix* (leaf-galls); reared at Washington, D. C. (Specimens collected across the Potomac in Virginia).

ON ANTHOMYIIDÆ.

Pachyneuron anthomyiæ Howard. From puparium of an anthomyiid, larva feeding on *Aphis citrulli*; reared by H. G. Hubbard, Crescent City, Fla.

ON SYRPHIDÆ.

Pachyneuron sp. From syrphid feeding on *Myzus ribis*; reared by Webster, at Lafayette, Ind.

Pachyneuron sp. From syrphid feeding on *Aphis brassicæ*; reared by Koebele, at Alameda, Cal.

Pachyneuron sp. From syrphus puparium; B. D. Eastman; *loc.?*

Pachyneuron syrphi Ashm. From syrphid puparium; reared by Ashmead, at Jacksonville, Fla.

Pachyneuron allograptæ Ashmead. From puparia of *Allograptæ obliqua*, larvæ of which had been feeding on *Aphis brassicæ*; reared by Ashmead, at Jacksonville, Fla.

Pachyneuron sp. From puparia of *Baccha babista*, larvæ of which had been feeding on *Aphis citrulli*; reared by Hubbard, at Crescent City, Fla.

Pachyneuron sp. From puparia of *Mesograptæ polita*, larvæ of which had been feeding on corn pollen; reared at Washington from specimens received from New Jersey; also reared by Ashmead, at Jacksonville, Fla.

Pachyneuron sp. From puparia of *Baccha?* sp., larvæ of which had been feeding on *Aphis gossypii*; reared by Hubbard, at Centreville, Florida.

Thus we have records of twenty distinct rearings of species of this genus, and find that it is an enemy of such well-known pests as the grapevine Phylloxera, the grain plant-louse and the cabbage plant-louse, so that the Dr. Jekyll side of its two-faced character is extremely philanthropic. In addition to placing on record the anomalous features of the habits of the insects of this genus of parasites, the short historical summary of my own impressions will serve to point the old, old warning as to the danger of attempting a generalization without broad foundations and extended material.

Mr. Schwarz read the following paper:

CONTRIBUTION TO THE LIFE-HISTORY OF *CORTHYLUS PUNCTATISSIMUS*, AND DESCRIPTION OF *C. SPINIFER* N. SP.

BY E. A. SCHWARZ.

The food-habits of *Corthylus punctatissimus* remained unknown until, in the fall of 1882, Dr. C. Hart Merriam discov-