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NEW HISTORIES AND SPECIES IN PAPAIPEMA AND HYDRÆCIA.

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(Continued from Vol. XLI, page 118.)

The environs of large cities are often prolific of *Papaipema* species, which, in comparison with rarer forms of other Noctuids, quite surprise one at first. While the flora of a section must indeed be indicative of the species to be expected, it is an undisturbed and unburned flora that at this day exerts a lasting influence on the perpetuation of these moths. So it happens the very urbanity which drives much insect life away helps, through lessening the indiscriminate burning of neglected areas, where a fire might be dangerous to buildings, to allow many species of this genus to breed in good numbers. Although a preferred indigenous food-plant has been established for most of their known larvæ, there is one introduced weed to which a great many will substitute upon necessity, this is the common Burdock, *Arctium*, and its prevalence in vacant city lots and waste places is sure to be detected by some of these boring larvæ. In fact, it is hard to find an extended growth of Burdock that is not bored by some *Papaipemid*, though *cataphracta* and *nebris* are the species to be generally expected. Investigations around Buffalo, N. Y., show an unusual number of species in *Arctium*, and several unfamiliar forms are bred. The primitive flora and fauna of this section must have been very rich; the extreme fringe of the prairie zone here met the general Atlantic State forms, with conditions of damp bottom lands and water margins in proximity to the sand-dune life of the lake shore. It certainly reflected many varied characteristics, as is evidenced by the flora of Niagara Glen to-day.

Opportunity was offered to observe *Papaipema harrisii* in well-established colonies, and the following notes are additional to published data:

The wide dispersion of *Heracleum lanatum*, the preferred food-plant of this species, would naturally suggest some environmental forms, but aside from this, much instability in colour of the imago is found in every colony, and the range of variation seems most marked with it. We may use the term colony, for though in no sense gregarious, the persistent

nature of *Heracleum* in circumscribed areas permit broods to continue and inter-breed for a great many consecutive years. Hence the more apparent reason for environmental forms. And it is not the moth alone which shows variability, the larva exhibits a feature of individual instability with a tubercle plate which has not been observed with others. As only the mature larva has been described, attention may be drawn to the rest of the life-cycle which follows the normal routine. Ova deposited in September winter over and emerge during the last week of May. The early stages of the larva show the characteristic markings; colour light brownish-maroon, which becomes very dull in the penultimate stage, with longitudinal lines white. The dorsal line is continuous, the subdorsal is broken on joints four to eight. This feature places the larva in the grouping to which *nebris* and *marginidens* belong, and holds with each stage except the last. The tubercles are as usual, well marked and normal for the genus, excepting the accessory IVa, on joint ten. This is small, never as large as IV on the preceding joints, as holds with *cerussata* for instance. Its uncertain accession is marked in that some specimens have it and some do not, and, further, that an individual may have IVa on one side and not on the other. The thoracic and anal shields are of the usual prominence, and at maturity the colours fade to a soiled, whitish translucence. Crochets of prolegs in single row of equal length, hooking out from a broadly U-shaped setting, colour brown, number twenty; as contrasted to *cerussata*, where the number is twenty-two, colour black and the hooks slightly larger. Larvæ leave plant for pupation; July 25-31; moths emerge in four weeks.

A familiarity with the type form, the extreme of variation where the stigmata are black and the primaries darkly suffused, designated by Hampson as aberration No. 1, Vol. IX, Catalogue of Phalænæ, together with the usual intermediate variations, following a three-years' study of Buffalo material, has given the writer a fuller knowledge of *harrisii*, which seemed necessary before passing finally on two apparently allied forms. One is from California, a species discovered by Mr. F. X. Williams, of San Francisco, bred by him from larvæ boring *Cirsium occidentale*. He kindly forwarded a number of the pupæ within their borings where they had changed. One larva had died of a fungous disease, drying into a satisfactory specimen, and was seen to be of the common type, as shown by *harrisii* and *arctivorens*, but altogether seemed within the scope of a geographical race of the former. Satisfactory evidence to the contrary is now at hand, and the following name is proposed:

Papaipema erubescens, n. sp.

Form congeneric, front smooth, pattern typical. Head and thoracic vestiture yellowish or fawn, mixed with rosy-brown, collar tipped above in lighter shade. Antenna ciliate, with tuft of white scales at base. Primaries rather narrow, apex acute; basal, medial and terminal areas yellow, powdered with purple-brown; the ante- and postmedial areas dull purple, but contrasts are not strong, due to the more or less dense powderings. Postmedial line most prominent, indistinctly double, the inner line brown the outer dark purple. It projects very slantingly outward from the costa, making quick turn at vein six, thence nearly straight to inner margin, which it meets at a much less oblique angle. Stigmata usually white, sometimes entirely yellow; size normal, agreeing with typical *harrisii* in definition. The central mark of reniform and the outer middle portion always yellow, the orbicular shows a central brown dot. Secondaries pale yellowish, more or less roseate, always with smoky medial band and the veins showing a little darker. The under side is more glistening and densely powdered with smoky-brown. The genitalia conform to the normal type for the genus in the harpes, but the curved hook arising on the side is without the usual teeth on the posterior edge. Expanse, 36-40 mm. Habitat, San Francisco, Cal., and probably over the range of its food-plant in that State.

Eleven males are for comparison, and other specimens have been seen. A male type is in the author's collection, and cotypes are with Messrs. Mæser and Williams.

While somewhat variable, *erubescens* will be easily recognized superficially and by the wing outline. The smooth hook or clasper of the genitalia is not duplicated exactly in any other species, except the Californian *angelica*, whereas the toothed form of this process holds with over thirty species, and is a feature emphasized by Prof. Smith as an exception for the Noctuids, at the erection of *Papaipema*. Mature larva similar to *harrisii* series in size and appearance. Head normal. Colour pale flesh-tint, whiter on last five joints, lines lost. Tubercles prominent, roughed; IIb, III and IV large and close together on thoracic joints; IV the largest on the abdominal ones, with no trace of IVa on joint ten. Shield smooth, glistening-brown; spiracles black. Pupa very cylindrical, though not apparently cramped in the burrow; similar to *impecuniosa*, though the latter is always wedged tightly in the boring. There is no unusual feature, no prominence on the front, and there may or may not

exist a small bifidate spur. Colour brown. Length, 18-20 mm. Dates of emergence of series, Aug. 25 to Sept. 14.

In the season of 1908 a number of nearly matured *necopina* larvæ were secured boring in Burdock about Buffalo. From this lot, supposedly all alike, a rather large, dark ochreous *Papaipema* moth appeared at an early date, being, in fact, the first specimen to emerge from a large series of various species. It had concolorous stigmata, and differed from anything previously seen. A relationship to *imperspicua* seemed most probable, and the next year the Burdock were closely observed for some unfamiliar larva which would prove this species. Nothing out of the ordinary could be detected, however, though the final aggregation from this plant again produced one of these aberrant moths. Mr. Mæser, the local enthusiast, found, when emergence began, that he had succeeded in locating the oddity boring in *Angelica atropurpurea*, and secured a good series of the moths. In 1910 he sent on the larvæ, which seemed to work in *Angelica* as a preferred food-plant, though many occurred in *Heracleum* also, and the two last stages were observed. An extended series of the moths show the stigmata may become fully white, when they become comparable to a smoky variation of *harrisii* that is white-spotted. The result of the study is to conceive this form an aberration of the Grote species that is forsaking *Heracleum* as a staple diet, which probably represents a prairie race, and really gives an example of a species in the making. As it never seems to revert to the type form as exemplified by Kittery Point, Maine, material, and is in no sense a case of individual variation, and, indeed, may prove entirely distinct, a designation for it as an aberration of *harrisii* at least seems advisable.

Papaipema rubiginosa, new aberration.

Head, legs and thorax dull purple-brown, irrorated with yellow scales; abdomen lighter. Collar edged above with yellow, the spreading tuft of usual proportions. Fore wings dull yellow, with smoky-brown powderings more or less dense. At the hinder margin the yellow becomes brighter, due to less powdering. Basal and medial areas the same shade of yellow-brown; ante- and postmedial areas purple-brown, but with little contrast. Terminal space faintly lighter and yellower; as is also the apical patch. Basal line sinuous, double, filled in with yellow, not always well defined; antemedial line sinuous and indistinct; median shade line shows plainly from the lower end of the reniform, extending straight and obliquely to the inner margin paralleling the postmedial. The latter distinctly double and

nearly straight. The orbicular and claviform are indistinctly defined in dark purplish, sometimes partly outlined with bluish-white atoms. The reniform indistinct, the central lunulate line strongest and shown in yellow. Or the stigmata may be wholly pure white, but gradations between the two have not been seen. The hind wings are smoky-brown, paler in some specimens and usually show a medial shading. Beneath the medial lines are stronger, on a lighter, more luteous ground. Fringes slightly dentate. The male genitalia agree with the common type, does not differ to a noticeable degree from *harrisii*, or, for that matter, from *arctivorens*, *nebris* and others. Expanse, 38-42 mm.

Habitat.—Buffalo, N. Y.

A series of thirty-two specimens have been examined, and a cotype is in Mr. Møeser's collection. *Rubiginosa* differ from aberration No. 1 of Hampson in general ground colour and in the definition of the postmedial line, which in the latter are counterparts of the typical specific maculation. Types of both forms are with the author.

The larva in penultimate stage is similar to *harrisii*, and is hard to differentiate by any character of notice. Head is a little larger, and the lines appear better defined, the dorsal alone being continuous. Tubercles normal, brownish-black, rather small. An accessory IVa, which is very small, occurs on joint ten, shields and leg-plates normal. Larvæ are thus far advanced about July 20.

At maturity the colour is a whitish translucence, the tubercles become blacker and larger, which is an unusual feature. On joint ten IVa becomes as large as IV on the preceding joint, and occupies a corresponding position. Some variation may exist in this, however. The setæ seem especially well developed, even those ventrally situated on the small tubercles on joints 4 and 5, that apparently merge into the leg-plates on the succeeding four joints, are easily discerned. Length, 42-44 mm. July 30 finds most larvæ full-fed and the borings deserted. The pupa is entirely normal. Emergence ranges from Aug. 17 to Sept. 9.

By far the finest disclosure for 1910 was the apprehension of a beautiful, distinct and unknown species at Buffalo by Mr. F. E. Møeser. This new departure had escaped him by a narrow margin the previous season, but by persistent effort and an early beginning he was able to round up a species well worth the pains. As with other similar surprises in this genus, one wonders how such a thing has escaped notice so long. Its beautiful tints, comparable to a cross between a high-coloured

marginidens and *cerussata*, make it a very striking species, and though much smaller, would court notice at any collector's hands. The quest for the larva of *Xanthæcia buffaloensis*, known only in the single example taken many years ago, which stands as the British Museum type of *Papaipema speciosissima* and *furcata*, taken in recent years in a few random imagoes at light, had served to keep an interest in larva-hunting, which now meets with this unexpected reward. Thus, in recognition of the persistent and skillful work done by Mr. Møeser in this group, it is fitting to dedicate this fine species to him.

Papaipema mæseri, n. sp.

Antenna slightly ciliate, front smooth, habitus typical. Vestiture of head and thorax rich purple, collar edged with cream, crests and tufts fully normal, abdomen dull purple-gray. Primaries short and stout, yet acute at apex; ground colour rich violet-brown, the medial area red, irrorated with yellow toward the inner margin, the ante-, postmedial and terminal areas purple, with a satin sheen; within the basal line the usual contrasting spots are yellow and not large, an elongate dot outside this line at its middle; antemedial line indistinct, very sinuous, touches lower edge of claviform and bends outwardly before reaching the inner margin, claviform two obliquely placed, rounded, white spots, the lower twice or three times the size of the upper; the orbicular, whose axis is in the same oblique line, is an irregularly rounded white spot, sometimes centrally marked with a brown dot; reniform large, the usual cluster of broken white spots around a yellow lunulate line, except the spot at the middle outer side, which is yellow; five yellowish dots on costa; postmedial line, two fine indistinct lines, beginning on costa above and very near the reniform, past which it sweeps in a full curve, nearly touching again the lower end, and thence nearly straight and oblique to the inner margin; the deep brown median shade is noticeable in its lower course across the median field; terminal line defined by an illumination of glistening orange scales, inwardly dentate between the veins and brightest near the apex; it serves to define the terminal from the postmedial areas, which otherwise would be a solid blending of rich purple gloss. Secondaries violet-gray, with a fine, indistinct medial line and terminal band. Beneath the violet-gray is darkened with smoky powderings. The male genitalia, though typical, shows some individuality; the lower lobe of the trigonate end of the harpes, as occurs with the *harrisii* group, is aborted, and the clasper-hook, bearing the typical teeth, seems finer and shorter. Its

design approaches *sciata* and *impecuniosa* most nearly. Expanse, 34-36 mm. Dates of emergence, Aug. 23 to Sept. 28.

Habitat.—Buffalo, New York City, N. Y.; Montreal, Que.

Eighteen examples furnish the description. A male and female cotype are with Mr. Møser, and a male type and female cotype are with the writer. *Møseri*, in its freshness, is very distinct from any well-known species. It is constant in colour and size, the only variation in the series being in the outward curve of the postmedial line where passing the reniform, which in one specimen angles inward at this point, deflecting the usual true sweep, and some specimens are a little yellower.

Nepheleptena Dyar is very close in some respects, but differs in the angle that the white spots bear to the costa. From a cotype sent to the National Museum Dr. Dyar inclines to concur in its distinctness. Unfortunately, *nepheleptena* is not represented by a very bright example in the unique type.

The writer has seen a great deal, first and last, of the species *cataphracta*, as will anyone who investigates *Papaipema* life-histories. It is the one general feeder, the only thorough plebian, the great ubiquitous nuisance. Its list of food-plants include about everything the other species eat, so one cannot help gathering them in along with desiderata, as well as a host of others. As the seeker in these larval investigations is always on the alert to detect some new food-plant being bored, the work of this species is constantly brought to the front and deplored, after the moment of hope that sprung from some new observation. Further than that, the larvæ change to pupæ within their borings, which adds to the flame, for one may happen on the pupæ in some new and likely food-plant, only to be disappointed later, after a long wait, for the moths are tardy in emerging.

Our fingers seem still to tingle from the great box of Nettle-roots which were once painfully gathered in, thinking the small pupæ contained therein would surely prove a novelty. Hope continued to mount until after the first of October, in this instance before the first *cataphracta* appeared, when the disappointment was correspondingly keen. Which is but one instance out of a great many. But there is a redeeming feature, its larva can be easily identified, for there is none other just like it, and upon a glance it may be returned to its newest food-plant. Further, if the plant is large and the stage late, one may detect its work by the large amount of frass thrown off, for it is a great gourmand, and no false hopes need be entertained for a moment. Yet it is not a common species in

flight, and many good collections of Noctuidæ are without a representative. This digression is but to emphasize the fact that the writer is familiar with the species, and in all the years up to encountering the Buffalo fauna we will say in pattern, colour and design it has been constancy itself. Not the faintest fleck of white has ever appeared in the stigmata for instance, the weak point in *Papaipema*.

But the Buffalo Burdocks seem replete with enigmas, and a darkly suffused, white-spotted form appears, which, did not more apparent intergrades exist to the normal form, would warrant the assumption of further specific departures. From circumstantial superficialities one would declare that the *necopina* and *cataphracta*, with which these plants are teeming, had irredeemably mixed, though their very numbers might argue against the need or likelihood of hybridism. Even *necopina* shows apparent taint in examples deeply powdered with the peculiar yellow tint of *cataphracta*, running to forms having a well-defined and white-marked reniform. Whatever the cause, the only facts known are that this peculiar aberration is produced from a larva having the full specific attributes of *cataphracta* in the last two stages at least. A rather striking feature with this new form is that it begins to emerge in August, whereas the type form rarely begins before Sept. 15, and continues until the middle of October, for New York State at least. A name for this form of *cataphracta* is considered desirable, and the following is proposed :

Papaipema fluxa, new aberration.

Vestiture of thorax purple-brown mixed with gray. Primary broad, entirely suffused with umber-brown, concealing more or less the yellow under colouring and the usual lines ; ante - and postmedial areas faintly show a purple reflection ; stigmata small and white-marked, or the orbicular and claviform may be lost entirely, or the reniform may show the outer spots yellow ; a powdering of yellow scales over the lower median area, producing a patch at the apex, and a sprinkling is noticeable on the costa. Secondary the smoky-gray of the abdomen. The genitalia agrees with type form. Expanse, 34-38 mm.

A cotype is with Mr. Møeser and a male type with the author.

Papaipema arctivorens Hmpsn.

The life-history of this species has never been fully recorded. It is an Eastern Canadian form, occurring commonly about the City of Montreal. Its larva bores in stems of *Arctium lappa*, *Cirsium lanceolatum*, *C. arvense*, *Dipsacus sylvestris* and other thick-stemmed weeds. A

preferred indigenous food-plant has not been associated with it, and its range is surely of a northern character. Its prevalence in *Arctium* was very marked in the season of 1909, all undisturbed waste places, even in the heart of the city that are productive of this weed seem to support flourishing colonies. *Cataphracta* and *necopina* occur with it in much less numbers, but the work of *arctivorens* is confined more particularly to the top of the plant. It prefers to pass most of its period in the parts at the head of the main stem or branches, which produces a more or less aborted growth. At the middle of July the midday sun causes a noticeable wilting of the growth above the cell-like boring, and as several examples are often in one plant, the effect becomes marked. Mr. A. F. Winn, who, among other of the Montreal collectors, has had the species long under notice, years ago coined the term "hydræcitis" for this appearance of the plants. Of his interesting observations he has seen the newly-emerged larva ascending the plants and drilling its way within the stem, and has drawn our attention to a parasitic wasp, which is an additional species as effecting this genus.

Ova were secured Sept. 6 from a pair confined in a roomy vivarium. They were deposited scatteringly without apparent design, singly or in small clusters. The egg is slightly flattened, the greatest diameter .6 mm., colour yellowish pearly-white. They winter over and emerge the latter part of May.

Stage I.—Generic characters fully evident, the dark middle joints, four to eight, are crossed by the continuous whitish dorsal line, the sub-dorsal being here discontinued; tubercles and setæ pronounced, the latter on abdominal joints one, two and three appear longer than the others; true legs black; spiracles ringed with black; head and shields shining yellowish.

Stage II.—Similar to preceding, the darkened portions become darker now, a deep purple-lake, the lines purer white. Tubercle IV becomes larger on abdominal joints.

Stage III.—As before; head and thoracic shield of equal width, polished, yellowish, a black line from the ocelli crosses the epicraneum obliquely to lower edge of shield, which is here bordered with black; tubercles blacker.

Stage IV.—Colours as before; the first pair of abdominal legs are still shorter, but now used; the blackish line on head and lower edge of shield finds continuation in the dark body colour existing as a stripe on

the thoracic joints between the white subdorsal and substigmatal lines; tubercle IVa now occurs on joint ten, at the upper corner of spiracle, is slightly larger than IV on this joint, but smaller than IV on the preceding one; I and II small on all joints to eleven.

Stage V.—Similar to preceding, colours intense, lines sharply defined, joints four, five, six and seven show as a solid girdle of blackish-purple, except where crossed by dorsal line. Tubercle IVa on joint ten as before.

Penultimate stage.—Similar, except the ground colour fades to a lighter shade; tubercles the same, IVa holding its corresponding size, and is without seta.

Mature larva; head normal, smooth, polished, now becomes brownish-yellow, side marking lost, though shield holds its conspicuous black edging; ocelli and mouth-parts touched with black; epicranial setae normal, of about equal length, IV seeming longest, adfrontal area defined by nearly straight sutures; thoracic shield wide as head, long as joint one, smooth, shining, yellowish-brown; anal shield forms similar protection to joint twelve, but its surface is minutely roughened with granulations; tubercle IV is largest on first ten segments, exceeding the spiracle, on joint eleven III slightly exceeds IV, as do I and II, on joint ten IVa still holds the size of true IV lower down; all are brownish-black; spiracles dull black; crochets of prolegs similar to *harrisii*; body colour has now faded to whitish translucence, all lines lost; length of larva per stages, 6, 9, 12, 20, 26, 34, 42 mm. Larval period fifty to fifty-six days.

The boring is forsaken usually, and the pupal period, covering twenty-eight to thirty-six days, is passed in the ground or beneath some slight covering of refuse. The pupa is shining brown, the wing-cases well defined and thin enough that the stigmata are plainly seen shortly before emergence; abdominal joints taper evenly; a slight bifidate spur. Length, 18–22 mm.

Among the yellow-brown species of the genus of which it is a good type, *arctivorens* comes closest to the yellow, or type form of *harrisii*, both in larva and imago. Its individuality seems most pronounced in the white marking formed by the orbicular and claviform, being proportionately larger than with its allies, a feature especially accentuated in dwarfed or abnormal examples. There is no erratic variability as occurs with *harrisii*. The genitalia are of the usual pattern, showing no distinguishing features.

Papaipema rigida.

The list of food-plants can be increased to include *Helianthus tuberosus*, *Arctium lappa* and *Zizia aurea*. The preferred food-plant, instead of *Helianthus decapetalus*, as stated by the writer in this magazine, Vol. XLI, p. 116, should be revised to *Heliopsis helianthoides*. The latter is by far most accepted, and seems very generally bored under favourable conditions. This plant does not occur at Rye, N. Y., and here *rigida* flourishes to some extent in the roots of *Zizia*, which is not nearly so well suited for such a larva. The examples in *Arctium* were plainly cases of substitution.

An undescribed western species of *Hydracia* has been referred to the writer, for which the following name is proposed :

Hydracia repleta, n. sp.

Head and thorax clothed with admixture of yellow and reddish or garnet, hair-like scales, abdomen darker. Fore wings brown, of a nearly even shade, probably with red or garnet tinge when fresh ; basal area rather large, yellow, defined by a double inwardly-waved line at vein I, beyond this point an elongate white dot ; antemedial line double, filled in with yellow ; median shade faintly discernible, blackish ; orbicular large, round, white, with central speck of brown ; claviform rounded, white, bisected by brown hair line ; reniform large, a yellow bent bar surrounded by white spots divided by brown hair lines ; postmedial line double, ill-defined, illuminated near costa by yellow scales, bends outwardly past reniform, thence with ogee curve to inner margin ; subterminal line irregularly waved and generally parallel to postmedial ; postmedial area probably shows purplish-sheen when fresh ; terminal space faintly dashed with yellow between veins, and a yellow blotch at apex. Hind wings solid, dull black, with pale rufous fringes. Beneath the wings are smoky-black on a luteous ground, having a garnet suffusion at costal and terminal areas ; a black medial line and discal spots. Expanse, 34-36 mm.

Habitat.—Huachuca and Chiris Mts., Paradise, Ariz.; Aug. 21 to Sept. 13. Collector unknown.

Three specimens are at hand through the courtesy of Prof. J. B. Smith, who retains a male and female cotype.

The species is an exact counterpart in maculation of the fore wing of the well-known *serrata*, which seems common at Denver, Colo. The one male specimen is minus antennæ, so it cannot be stated if it has this pectinated as holds with its ally. The darker tone and black secondaries easily separate them, however, though the genitalia of the new form does not differ markedly from *serrata*, which has been figured by Prof. Smith.

NOTES ON THE BREEDING OF *TROPIDOPRIA CONICA* FABR.*

BY G. E. SANDERS, DIVISION OF ENTOMOLOGY, OTTAWA.

In carrying on some dipterous experiments in the Division, in August, 1910, many of the puparia of *Eristalis tenax* Linn. were found to contain the well-known parasite *Tropidopria conica*. About forty per cent. collected under natural conditions in August and September were found to be infested, giving on an average 35 adult parasites to each puparium. The highest number from one puparium was 46, and the lowest 21.

Emergence.—This takes place through one or more round, somewhat jagged holes, about 3 mm. in diameter, cut in the side of the puparium. The holes are cut by the adult after they have completed their transformations. All the parasites in one puparium appear to complete their transformations at the same time, showing no indication of a partial retarded development as is so often found in similar parasites.

Mating.—About three hours after emergence many pairs were seen together, apparently in coitu; closer examination, however, showed that

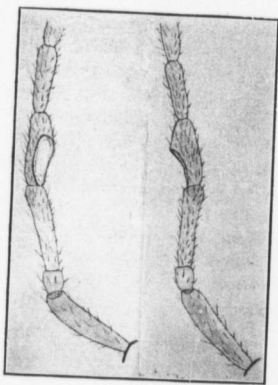


FIG. 2.—Proximal portions of antennae of *Tropidopria conica* (x 45). A, right antenna; B, left antenna.

this was not the case. The male had placed himself firmly upon the dorsal surface of the female, and with his two front tarsi had caught hold of the antennae of the female and drawn them upwards and backwards until they lay nearly perpendicular, one on each side, close to the fore part of his thorax. The antennae of the male were thrown back so that the sense organ, or gland, situated on the fourth antennal joint, as shown in figure 2, lay directly against the antennal club of the female. This organ was being passed quickly up and down the female's antennal club, and was evidently intended to excite the female sexually; the wings of the male were raised and fluttered continuously during the process. Often

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lasted for from thirty to forty seconds. Copulation did not follow in all cases; in several cases it did. The exciting process appears to be always preliminary to copulation.

The gland-like organ is found on the fourth antennal joint of the male in *Tropidopria* and many allied genera, and it appears that its sole purpose is for the exciting of the female in the manner described.

Oviposition.—This takes place in the puparium. The earliest instance was observed forty-eight hours after emergence. The ovipositor is, in all cases, inserted directly back of the respiratory "horns" in the suture forming the cap, which is forced off by the *Eristalis* adult in emerging. Freshly-found puparia were selected, when possible, for oviposition in preference to those in which the host was well advanced. It was observed, however, that they would deposit their eggs in old puparia when only one is exposed. Several such cases, even when the female was known to be fertilized, did not harm the host, the adult *Eristalis* emerging. The ovipositor appears to be inserted by a straight slow thrust; the body of the female while ovipositing is raised in a semi-circle, except for an occasional movement of the antennæ, which for the most part are extended forward and rest upon the puparium. The time from the insertion to the withdrawal of the ovipositor was taken in four cases, being 173 minutes, 185 minutes, 96 minutes and 101 minutes respectively.

Development.—The larva is an internal feeder, developing and transforming within the soft tissues of the abdomen and thorax. In the early stages they do not retard the development of the host, as in instances where the puparia were known to be freshly formed when the eggs of the parasites were deposited in them, and when one of these was broken open fifteen days later the head, thorax and legs of the fly were found to be perfectly formed.

Length of cycle.—The two broods carried through from the egg to the adult took, in one case, 36 days, from August 7th to September 12th, and in the others 41 days, from September 7th to October 18th; in this last case the larval and egg stages were 30 days and the pupal 11 days. On account of the difficulty found in rearing the larvæ the cycle of the host could not be determined accurately. Data taken in the latter half of August and in September, when put together give the complete cycle at about 30 days—about 18 days larvæ and 12 days pupæ—in all a shorter cycle than that of the parasite.

The adult *Tropidopria* is particularly long-lived; in one lot, which emerged on September 21st, the majority lived until October 12th, and a few survived until October 14th.

Parthenogenesis.—Several pupæ were removed from one puparium and placed singly in gelatine capsules in order to secure unfertilized females. These, when they emerged, were placed on puparia which had been reared from larvæ, and were known to be free from parasites. On September 18th 9 adults, all males, emerged from one puparium.

Relative number of the sexes.—Under natural conditions there is a great preponderance of females. From one phial containing several puparia, 298 parasites emerged; of these, 101 were males and 197 females. Two lots, each from one puparium, were examined, the one was found to contain 9 males and 35 females, the other 17 males and 29 females.

MELITÆA THEONA MENETRIES AND ITS SYNONYMY.

BY KARL R. COOLIDGE, PASADENA, CALIFORNIA.

Melitæa theona was described by Menetries in his *Enumeratio corporum animalium Musei imperialis Academiæ Scientiarum Petropolitaneæ*, 1855 (p. 86, and a figure, 5, on plate 2). Dr. Skinner has kindly sent me a copy of the original description, which reads as follows:

"444. *Melitæa theona* nob.—Encore une espèce de ce groupe américain de nos *artemis*, *athalia*, etc., dont on compte déjà plus d'une dizaine d'espèces. Sa taille est celle d'un petit individu de la *M. athalia* Esp., c'est-à-dire d'un pouce deux lignes d'envergure. Au premier abord, elle ressemble un peu à la *M. editha* Boisd. En dessus, les ailes sont d'un brun noirâtre, avec des bandes formées de taches jaunâtres et fauves, ainsi disposées: aux ailes supérieures, la bande la plus externe est composée de taches fauves, à l'exception de la 4^e, qui est plus grande et d'un blanc jaunâtre; la seconde bande, qui est plus interne et plus irrégulière, est formée de 7 taches d'un blanc jaunâtre; plus près de la base, on remarque plusieurs taches fauves, séparées entr'elles par une tache d'un blanc jaunâtre, placée diagonalement au milieu de la cellule discoidale, puis une autre en dessous de cette cellule, plus poché de la base enfin une 3^e allongée, dans la cellule et plus rapprochée encore de la base. Les ailes inférieures présentent une bande parallèle au bord externe, composée de 8 taches fauves, ces taches sont arrondies à leur sommet et tronquées inférieurement; le disque est coupé par une autre bande parallèle de 8

taches oblongues, également fauves; et enfin, plus proche de la base, on compte 3 ou 4 taches peu distinctes. En dessous, les ailes supérieures offrent de plus, outre le dessin du dessus, une rangée de petites taches blanchâtres qui part du sommet et le long du bord externe; la base est fauve, présentant les trois taches blanchâtres du dessus, entourées d'une ligne noire. Les ailes inférieures diffèrent du dessus, en ce qu'elles présentent de plus une bande de taches blanc-jaunâtres, le long du bord externe; la bande qui traverse le disque de l'aile est formée de taches oblongues d'un blanc jaunâtre comme en dessus, mais bordées de noir inférieurement et d'un simple liséré de cette teinte antérieurement; la base présente une bande de taches, en rayons, étroites, surtout les plus internes, d'un blanc jaunâtre, un autre plus bas au milieu, le tout reposant sur un fond fauve." The type locality is given as Nicaragua.

Edwards, in 1870 (Trans. Ent. Soc. Phila., Vol. 3, p. 191), described *M. thekla*, "taken by Dr. E. Swart in So. Calif.," and which has since been found to occur commonly in Arizona and Texas. I know of no definite locality for *thekla* in California, and Mr. W. G. Wright (Butt. West Coast) has apparently never met with it in this State. *Bollii* Edwards was published in Field and Forest, Vol. 3, p. 101, 1877, and is a synonym of *thekla*, as Dr. Holland, who possesses the types of both, has pointed out. Dr. Scudder, in his Synonymic List of the Butterflies of North America, Bull. Buff. Soc. Nat. Sciences, Vol. II, p. 265, 1875, gives for the habitat of *theona*, which with *leanira* and *thekla*, he places in his genus *Thessalia*, "So. Cal., Nicaragua and Guatemala." Boisduval, in the classic Lepidoptères de la California, p. 55, 1869, says of *theona* that "Cette espèce très commune dans certaines localités du Mexique, a été retrouvée dans la Sonora par M. Lorquin." Sonora evidently is referable to Southern California. I have long suspected that our *M. thekla* is a pure synonym of *theona*. Certainly the description of *theona* is applicable to either *thekla* or *bollii*, and furthermore, Godman and Salvin, in the Biologica Cent. Americana, state that specimens of *bollii* and *thekla* from northern Sonora are not distinguishable from *theona*, except in being somewhat more fulvous. It is quite obvious then that *thekla* and *bollii* must be relegated to the synonymy of *theona*, which has long priority. It is a matter of astonishment that this group should have stood erroneously so long in our lists. Dr. Skinner (Cat. Rhop.) does not include *theona* in our fauna, but later in his first supplement (p. 9) he lists *theona* var.

perlula Felder (Wien. Ent. Mon., 5, p. 104, n. 80, 1861), which Doll. Ent. News, Vol. 15, p. 350, 1904, reports from Brownsville, Texas. I am totally unacquainted with this, but believe that it is another *theona* synonym, or that the identification is incorrect, as *perlula* is not known to occur in the intermediate region between Texas and Venezuela. The Biologica makes no mention of it. Dr. Dyar, Bull. 52, U. S. Nat. Museum, includes *theona*, and gives it the habitat "Texas, Colorado," placing *fulvia* Edwards as a synonym. This is certainly incorrect, as *fulvia* is a synonym of *alma* Strecker. Strecker, Cat., p. 126, 1878, records *theona*, No. 231, from S. California, S.-West Texas, Cent. America. Dr. Smith's Catalogue gives *theona* (No. 110), and places it between *wrightii* and *thekla*. The synonymy is as follows:

Melitæa theona Menetries.

syn. *thekla* Edwards.

bollii Edwards.

M. definata Aaron belongs in this group, and may be the insect recorded as *perlulu*.

The Department of Zoology and Entomology of the Ohio State University has recently received as a donation a fine collection of Lepidoptera from Mrs. Catharine Tallant, of Richmond, Indiana. The collection was made by Mr. W. N. Tallant during a series of years in the nineties and up to about 1905. It contains mainly species occurring in central Ohio, especially at Columbus, but has also a number of species from different parts of the United States, and also some fine samples of species occurring in South America, Japan, China, India, Ceylon and Africa. The collection contains about 10,000 specimens in most excellent condition, very beautifully mounted, and many of the species contain very full series, showing variations, etc., which will make them of special value for scientific study. They are, for the most part, carefully identified, included in good cases and cabinets, and will be kept under the name of the "Tallant Collection."

Taken with the other collections in Lepidoptera, the collection of Odonata left by Professor Kellicott, and those in various groups which have been accumulated by the efforts of the members of the Department, the University is now provided with an excellent collection of insects, including representatives in all the different orders, the total number of specimens probably coming close to 100,000.

HERBERT OSBORN, Columbus, O.

NOTES ON DIABROTICA AND DESCRIPTIONS OF NEW SPECIES.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

(Continued from page 16.)

D. peckii, nov. sp.

Yellow; head, intermediate joints of the antennæ, scutel, pectus, tibiæ and tarsi black; elytra smooth, shining yellow, each with a large quadrate black patch at the base and a large circular black spot at the apex, in the middle of each a round yellow spot. Length, $5\frac{1}{2}$ mm.

One example, Manatee Dist., Brit. Honduras, Dec. 6, 1909. Collected by Mr. Peck.

Head with fovea small and abrupt; antennæ a little more than half the length of the body, joint 2 short, 3 one-half longer, 4 equal to two preceding; 1 and 9-10 and base of 11 pale yellow, 2-3 cloudy, the rest dark. Thorax pale flavous, smooth impunctate, faintly depressed behind and at the middle, and obsoletely bifoveate; elytra very slightly dilated behind, smooth, shining, faintly and finely punctulate, longitudinally sulcate, when looked at from behind at a certain angle obsoletely, the basal black patches join at the suture, each is convex towards the apex and reaches nearly the middle of the elytra, but does not attain the lateral edge; the apical patch oblong circular, nowhere attaining the edge or suture.

Very close to *bioculata* Bow., but with three, in place of two, upper joints of the antennæ light, thorax wider and more indefinitely foveate, elytra much more sparsely punctured, and colour of markings dull black in place of blue or cyanous.

D. columbiensis, nov. sp.

Head, tibiæ and tarsi black, antennæ more than half the length of the body, joints 1-3 and 9-10 flavous, rest piceous, thorax rufous (like *varicornis* Jac.), deeply bifoveate, and sometimes an indication of a third just before the scutel, which is piceous; elytra yellow, strongly plicate, with a blue-black annulus at the base (often broken), and a curved fascia behind the middle, not attaining either edge (often broken); between these blue marks is a suffused rufous-orange band, and the tip is the same colour, abdomen and femora yellow. Length, 5-6 mm.

Type Columbia, also Ibague, Columbia (Fr. Claver) 4 var., Calif., Columbia (Rosenburg), (Venezuela, Mocquerys?).

February, 1911

Very close to *varicornis* Jac. and *Haroldi* Baly; from the former it differs by the black tibiae and tarsi and different colouring, from the latter by the narrower rufous thorax and different colouring, and from both by the shorter second and third joints of the antennae, which are short and equal; fourth much longer in ♂ and somewhat longer in the ♀; thorax a little longer than wide, lightly sinuate at the side; elytra slightly dilated behind; what I regard as the typical form has the basal ring-shaped mark, complete, contiguous at the suture, but not attaining the margin and without any projection at the outside rear, similar to what is found in *tibialis* and *adelpa*, the rear fascia is broken into broad spots, the general effect being rather orange-coloured, elytra with dark spots, surrounded with a lighter colour, after the manner of certain specimens of *Clarkella* Baly; abdomen and femora yellow. Two of the Cali examples have light piceous legs (immature?). In its elytral markings the variety, when the spots are broken, much resembles *semicirculata* Jac. from Bugaba.

D. chimborensis, nov. sp.

Head, scutellum, pectus, and tibiae and tarsi black, antennae piceous, flavous at base, joints 9-10 white, thorax a little longer than broad, rufous, shining, sparsely, finely, but evidently punctured, elytra pale yellowish-white, with a vivid cyaneous or bluish band at the base not attaining the margin (enclosing a round yellow spot) and an oblique fascia of the same colour behind the middle, femora and abdomen yellow, the former tinged with piceous at the apex. Length, $6\frac{1}{2}$ mm.

Type, one example "above Chimbo., 3000 viii, '97, Rosenberg."

Very like *tibialis* Jac., or *adelpa* Har.; frontal fovea not very deep, antennae a little more than one-half as long as body, the first joint pale, with piceous tip, joint 2 short, 3 one-half longer, piceous with pale bases, 4 almost one-half longer than the two preceding, joints 4-8 black, 9-10 and base of 11 white, thorax comparatively longer and narrower than *tibialis* and punctured, the forward band of the elytra, with its enclosed spots, is the same marking as *tibialis* and *adelpa*, but cyaneous in place of black; the posterior fascia is almost straight-edged, oblique and not right-angled or semilunate, as in the *tibialis* and *adelpa*. The form is moderately dilated to the rear, and the elytra are not plicate.

I have two examples from Caracas, Venez., which I include with this species, one of which was labelled as *tibialis* Jac. in his second collection.

D. purpurascens, nov. sp.

Head flavous, vertex and front tinged with purple, labrum black, antennæ fuscous, flavous at base and apex, thorax as long as broad, smooth, convex, impunctate, light piceous purple; elytra plicate, orange, with three basal spots, a common scutellar, and a humeral, and two transverse bands, one before and the other behind the middle dark piceous purple, and the lateral and sutural margins lighter purple, beneath and tibiae and tarsi light piceous purple, femora flavous. Length, 6 mm.

Two examples, olive-green label (Pachitea). Peru.

Antennæ three-fourths the length of the body, fuscous, lighter at the base, joint 9 white (10-11 missing), joints 2 and 3 almost equal in length, 4 much longer than the two preceding, the thorax in certain angles shows obsolete depressions where the usual foveæ are, sides very lightly sinuate; elytra moderately dilated to the rear, strongly plicate, thickly and strongly punctured; neither of the transverse fasciæ attain either the margin or suture, the anterior one, however, joins the humeral patch at the side, the sutural purple begins just behind the scutellar spot, the general colour beneath is light piceous-purplish with flavous femora. The purple colouring is probably much brighter in fresh specimens; seems to belong near *S. pustulata* Baly.

D. argo, nov. sp.

Head black, antennæ black, base of the first and joints 8, 9, 10 and extreme base of 11 pale, thorax yellow, smooth, transverse, depressed, obsolete trifoveate, scutel black; elytra nearly parallel, not plicate, punctured, yellow, a basal band and a curved fascia behind the middle, cyaneous, ♂ with a tubercle near the suture in the curved fascia, body below yellow, pectus black, legs yellow, tibiae and tarsi black. Length, 6½ mm.

One ♂, Cali, Columbia, ix, xii, '94 (W. Rosenberg). One ♂, 2 ♀'s, Pischindé, Columbia (Rosenberg).

The antennæ are about three-fourths the length of the body, joint 2 short, 3 nearly twice as long, 4 longer than both preceding united (♂), in the ♀ joint 3 is relatively a little longer; the thorax is much broader than long, sinuate at the sides behind, impunctate, shining, broadly depressed; the scutel is polished convex; the punctuation of the elytra is obsolete at the rear, but coarse and confluent anteriorly, the anterior cyaneous band occupies about quarter of the length, and except for the extreme inflexed edge of the elytra is entire, the rear fascia is about half the width of the

anterior band and convex anteriorly, the ♂ tubercle is on the forward edge. This species is, so far as I am aware, the only one in §1 where the ♂ has a sutural tubercle. It is of course nearly allied to those forms in the Baly-Gahan paper covering §2 "C."

D. songoensis, nov. sp.

Head black, antennæ, thorax, scutel and legs flavous, thorax bifoveate, elytra plicate, strongly punctate, pale flavous, with three basal spots, one common, wedge-shaped sutural, the other oblong humeral, and an oblique patch on the convexity behind the middle, and equidistant from the margin and suture, all vivid cyaneous blue. Length, 5 mm.

One example, Songo, Bolivia.

The mouth-parts are, yellow, frontal fovea very large and round, antennæ longer than half the body, joints 2-3 short, the latter one-half longer than the former, 4 equal to the two preceding; thorax about as long as broad, sides moderately sinuate, surface smooth, deeply bifoveate and depressed at rear; the elytra are slightly dilated behind, and the punctuation, especially forward, is comparatively coarse, the plication is not strong, and the suture is slightly depressed behind the scutel, the humeral blue marks are truncate at the rear. Comes near *5-maculata* Fabr.

D. klagii, nov. sp.

Head piceous brown, antennæ fuscous, prasinous at the base, thorax prasinous, convex, shining, impunctate, scutel flavous, elytra flavous, plicate, lateral edge prasinous, a common elongate sutural, a humeral, a median discal and a large apical blotch, chocolate-brown; body beneath and legs flavous, with the under part of the thorax, the antepectus and femora prasinous. Length, 6 mm.

One example (♂), St. Catharine, Brazil (Klages).

This species has superficially the appearance of *11-punctata* Jac. The antennæ are a little more than half the length of the body, joints 2-3 short and of equal length, the third obconic and stout after the manner of the forms near *simulata* Baly, fourth joint slightly longer than the two preceding (or the longest of all); the joints 4-10 are somewhat thickened and dilated so they appear stout, the thorax is very sinuate behind; the plication of the elytra is strong and about two or three sulcations indicated between it and the suture, the depression behind the scutel is narrow but well marked, and the punctuation is fine and even. I place it next *11-punctata* Jac., from which it is at once separated by the smooth thorax and incrassate antennæ.

D. septemplagiata nov. sp.

Head prasinous, with black labrum and piceous vertex, the fovea on top, very large and well marked; antennæ black, prasinous at base, tenth joint white; thorax prasinous, convex, shining, sparsely but distinctly punctured, and with three obsolete foveæ, scutel black; elytra prasinous, plicate, punctured, the disk longitudinally, obsoletely yellow from the base to near the apex, two spots at the base of each elytron, one common wedge-shaped sutural, the other small humeral; also two small round discal spots, one about the middle and the other directly behind on the convexity, all black; body below and legs yellow prasinous, tibiæ and tarsi black. Length, 7 mm.

One ♂ example, S. Catharine (Lüderwoldt).

Antennæ filiform, about three-quarters the length of the body, joint 2 short, 3 a trifle longer, 4 longer than both together, 9-10 white, base of 11 more or less white; the sides of the thorax are much rounded in front of the middle and nearly straight behind; the elytra are moderately dilated behind, shiny, thickly and strongly punctured, even a little confluent, along the suture forward; the depression back of the scutel is distinct but not noticeably great; the four round black spots on the disk, two on each side, are placed on a yellowish-green ground, so as to form the corners of a square, ::, and are the most noticeable thing about the species.

D. delrio, nov. sp.

Head prasinous, with piceous labrum and mouth, and black eyes; antennæ fuscous, prasinous at base; thorax prasinous, convex, shiny, impunctate, scutel piceous; elytra prasinous, plicate, with three flavous spots, the first basal, median, elongate, a trifle more than one-third the elytral length, the second submedian, transverse, slightly oblique, and a little nearer the suture than the margin, the third apical, round, equidistant from the suture and margin; below and legs flavous, with the thorax prasinous and tibia tinged with prasinous. Length, 5 mm.

One ♂ (?), Rio de Janeiro.

Antennæ about three-fourths length of body, joint 2 short, 3 scarcely one-half longer, 4 longer than the two preceding, thorax a trifle broader than longer, very slightly sinuate, elytra barely dilated behind, with one or two sulcations indicated on the disk of the elytra, punctuation fine and rather sparse. Among the green species this will come near *selecta* Jac. and *glaucina* Baly, but these, however, have the basal yellow spot humeral, here it is strictly median, and does not encroach on the humeral knob.

D. rosenbergi, nov. sp.

Head dark piceous, antennæ nearly as long as body, fuscous, with three upper joints flavous, thorax dark olivaceous, rather opaque, bifoveate, scutel piceous, elytra castaneous, with prasinous suture and margin, vanishing before the apex, and one or more cross bands of the same, indicated before and behind the middle; body beneath flavous, with piceous breast, legs with prasinous femora, and piceous tibiæ and tarsi. Length, 6-7 mm.

Three examples, two ♀'s, one ♂, R. Dagua, Columbia, Rosenberg.

This comes near *6-maculata* Baly, and also *curvipustulata* Baly, but differs in colour of the head, and the last three joints of the antennæ being pale, the elytra also are not spotted but wholly suffused, though I assume a larger series might show distinct spots. My ♂ has the antennæ nearly as long as the body, joints 2-3 short and equal, the latter, however, more obconic in shape, 4 nearly twice as long as both preceding, and easily the longest joint of all, three upper joints pale flavous, the extreme tip of the last piceous, the thorax and elytra are entirely castaneous (faded?) with a touch of piceous on the suture, the shoulders, and in the disk before and behind the middle; the punctuation of the elytra is thick and moderately coarse, and there are several indistinct sulcations on the disk.

D. rufopustulata, nov. sp.

Head prasinous, mouth piceous, antennæ prasinous, becoming fuscous at middle and end, thorax shining prasinous, deeply bifoveate, scutel piceous, elytra prasinous, almost parallel, depressed, strongly plicate, and punctured, each side with a bright rufous, round spot on the disk in front of the middle, and rather distant from the suture, also an indistinct rufous spot near the apex on the convexity, legs prasinous, tarsi and apex of tibia piceous, abdomen yellow, pectus black. Length, 4½ mm.

One (♀?) example, La Paz (Bolivia?), green label.

Antennæ about half length of body, joints 2-3 short and equal, 4 equal the two preceding, basal joint prasinous, then the colour gradually grades up to the eleventh joint, which is dark fuscous and the darkest of all, thorax is rather longer than broad, and nearly parallel, and the fovea large and deep, elytra rather dull, with the thick punctuation, flat, also depressed along the suture, the plication below the shoulder very strong and deep. The noticeable thing about the species is the rufous anterior spot, which is easily visible, and at once distinguishes this species.

(To be continued.)

TWO NEW GENERA AND SEVEN NEW SPECIES OF THE FAMILY APHIDIDÆ.

BY H. F. WILSON, OREGON AGRICULTURAL COLLEGE.

Amphorophora howardii, n. sp.

This species is dedicated to Dr. L. O. Howard, Chief of the U. S. Bureau of Entomology, who has in the past two years extended me many favours whereby I have been able to carry on my aphid studies with much benefit to myself.

Alate viviparous female.—General colour light brown; antennæ, head, thorax and legs black. Abdomen light brown, robust, and with a row of dusky transverse dorsally placed spots. Wings long, broad, and with the cubitus twice forked. Nectaries about one-fourth the length of the body, vasiform. Cauda ensiform, one-half the length of the nectaries; anal plate rounded; tip of abdomen and cauda with short bristles.

Antennæ with six segments and placed on prominent antennal tubercles. Spur of sixth longer than the third segment, and about five times as long as the sixth.

Measurements.—Length of body, 1.9 mm.; width, .9 mm.; length of antennæ by segments, I, .10 mm.; II, .05 mm.; III, .45 mm.; IV, .3 mm.; V, .33 mm.; VI, .15 mm.; spur of sixth, .7 mm.; total length, 2.98 mm.; length of wing, 3 mm.; total expanse, 6.5 mm.; nectaries, .41 mm.; cauda, .23 mm.

Apterous viviparous female.—General colour light brown, antennæ slightly longer than the body, and placed on more or less prominent tubercles; colour darker brown. Abdomen robust, each side with seven or eight dorsally placed black spots. Nectaries about one-fourth the length of the body and strongly vasiform; cauda ensiform.

Measurements.—Length of body, 1.75 mm.; width, .85 mm. Length of antennæ by segments, I, .10 mm.; II, .05 mm.; III, .4 mm.; IV, .29 mm.; V, .32 mm.; VI, .12 mm.; spur of sixth segment, .68 mm.; nectaries, .46 mm.; cauda, .22 mm.

This species was fairly abundant throughout the summer on the heads of *Panicularia nervata* among streams and in swampy ground about Batesburg, S. C.

Aphis sassceri, n. sp.

This species was sent to me by Mr. E. R. Sasscer, from Miami, Fla., where he collected it in the Subtropical Gardens from *Anona rectilinata*. Specimens were sent to me alive, and received June 2, 1910.

February, 1911

Alate viviparous female.—General colour orange-yellow, antennæ, thorax, distal ends of tibiæ, nectaries and tip of cauda dusky; wings hyaline. Antennæ with six segments, shorter than the body and not placed on antennal tubercles. Spur of sixth segment longer than any one segment, and about three times as long as the sixth; 5 slightly shorter than 4, and 3 and 4 about equal in length; third segment with four to six large round sensoria, fifth with one large sensorium near the distal end; first segment slightly gibbous at the upper inner angle. Head broad and nearly flat, slightly elevated at the inner base of each antennæ. Wings long and broad, veins hyaline. Abdomen robust, nectaries tapering and bent outward at the tip. Cauda two-thirds the length of the nectaries and knobbed at the end. Anal plate broadly rounded, tip of cauda and anal plate with a number of prominent hair-like bristles. Abdomen with a row of three black spots on each side, and also with a number of dentate tubercles in a line along each side.

Measurements.—Length of body, 1.05 mm.; width, 0.45 mm.; antennal segments, I, 0.05 mm.; II, .04 mm.; III, .17 mm.; IV, .14 mm.; V, .13 mm.; VI, .08 mm.; spur, .26 mm.; total length, .87 mm. Length of wing, 1.5 mm.; width, .56 mm.; total expansion, 3.82 mm. Length of nectaries, .12 mm.; length of cauda, .06 mm.

Apterous viviparous female.—General colour greenish-brown antennæ, tarsi, tips of tibiæ, and nectaries dusky. Antennæ six-segmented, nearly as long as the body and not on antennal tubercles. Antennal segments compare as in alate form. Body short and stout, nectaries tapering and curved outward. Cauda broad, short and pointed. Abdomen with a row of five or six dentate tubercles along each side.

Measurements.—Length of body, 1 mm.; width, .56 mm. Length of antennal segments, I, .05 mm.; II, .04 mm.; III, .22 mm.; IV, .14 mm.; V, .14 mm.; VI, .09 mm.; spur, .22 mm.; total length, .9 mm.; nectaries, .10 mm.; cauda, .06 mm.

Aphia minuta, n. sp.

Collected on Aero potato, Bureau of Plant Introduction greenhouses at Washington, D. C. The plant belongs to the morning-glory family.

Alate viviparous female.—General colour yellowish-green, antennæ, tarsi, tips of femora and tibiæ, and nectaries dusky. Antennæ with six segments, not set on antennal tubercles, and as long as the body. Third segment the longest, but the spur of the sixth is longer than the third and

fourth segments together, and about five times as long as the sixth; fourth shorter than the fifth; third with two to five large round sensoria. Nectaries thick, about as long as the tarsi and tapering. Cauda large and slightly longer than the nectaries.

Measurements.—Length of body, 0.47 mm.; width, 0.18 mm. Length of antennæ by segments, I, .026 mm.; II, .026 mm.; III, .09 mm.; IV, .52 mm.; V, .06 mm.; VI, .05 mm.; spur, .19 mm.; length of wing, .97 mm.; total expanse, 2.1 mm.; length of nectaries, .08 mm.; cauda, .06 mm.

Apterous viviparous female.—General colour yellowish-green, tips of antennæ, tarsi and nectaries dusky. Body oboval and almost as broad as long. Antennæ as long as the body, with six segments and not placed on antennal tubercles; third segment the longest, but spur of sixth as long as the third and fourth together. Fifth segment with one large sensorium near the distal end. Nectaries twice as long as the tarsi, thick and tapering. Cauda two-thirds as long as the nectaries, broad and with a semi-knobbed tip. Anal plate very short and broadly rounded. Cauda and plate with few long hair-like bristles.

Measurements.—Length of body, .59 mm.; width, .47 mm. Length of antennal segments, I, .03 mm.; II, .026 mm.; III, .11 mm.; IV, .10 mm.; V, .06 mm.; VI, .052 mm.; spur, .19 mm.; nectaries, .08 mm.; cauda, .06 mm.

Carolinaia, n. gen.

This genus is closely related to *Cerosipha* in that the alate forms have six segments in the antennæ, while the apterous forms have but five. Antennæ shorter than the body, and not placed on antennal tubercles. Venation of fore wing regular, hind wings with but a single cross-vein. Nectaries about one-fifth the length of the body, and swollen in the middle. Cauda one-fourth the length of the nectaries and tapering.

Carolinaia caricis, n. sp.

Alate viviparous female.—General colour greenish-yellow, head and thorax black, antennæ, legs and nectaries dusky yellow. Antennæ shorter than the body, six-segmented and not on antennal tubercles. Sixth antennal segment slightly shorter than the spur, and about half as long as the third segment. Third with seven to eight round slightly raised sensoria. Wings long and slender, fore wing with regular venation, hind wing with but a single cross-vein. Nectaries one-fifth the length of the body and swollen in the middle. Cauda very short and tapering.

Measurements.—Length of body, 1.55 mm.; width, .67 mm. Length of antennal segments, I, .045 mm.; II, .066 mm.; III, .3 mm.; IV, .13 mm.; V, .12 mm.; VI, .13 mm.; spur, .22 mm.. Length of wing, 1.86 mm.; total wing expansion, 4.17 mm.; length of nectaries, .59 mm.; cauda, .09 mm.

Apterous viviparous female.—General colour greenish-yellow, tinged with brown. Body quite flat, slightly rounded above, cauda slightly darkened at the tip. Antennæ less than one-half the length of the body, and with but five segments, spur of the fifth slightly longer than the segment. Nectaries one-fourth the length of the body, and swollen in the middle. Cauda short and triangular.

Measurements.—Length of body, 1.55 mm.; width, 1 mm. Length of antennal segments, I, .045 mm.; II, .045 mm.; III, .18 mm.; IV, .066 mm.; V, .066 mm.; spur, .135 mm.; length of nectaries, .58 mm.; cauda, .09 mm.

Specimens collected on seed pack of *Carex* sp.; quite numerous in swamps, with two to ten specimens on a plant. Batesburg, S. C., summer of 1910.

Pergandeida nigra, n. sp.

Alate viviparous female.—General colour grayish-black, antennæ, except segments one and two, and tibia and tarsi yellowish. Wings hyaline, veins dusky. Antennæ shorter than the body, six-segmented and not on antennal tubercles. Segments three to six and spur slender, one and two stout. Spur of sixth segment longer than third segment, third with four to seven large round sensoria more or less regularly placed. Head with a prominent frontal ocellus and raised at the inner base of each antennæ. Prothorax with a single dentate projection on each side. Abdomen also with a single protuberance on each side close to those of the thorax. Wings long and robust, with the second fork of the median vein running close to the edge of the wing. Abdomen robust, and with a number of protuberances on each side. Nectaries twice as long as broad and tapering. Caudal plate broad and tapering.

Measurements.—Length of body, .89 mm.; width, .39 mm. Length of antennal segments, I, .039 mm.; II, .039 mm.; III, .15 mm.; IV, .104 mm.; V, .09 mm.; VI, .065 mm.; spur, .26 mm.; nectaries, .065 mm.; cauda, .07 mm.

Apterous viviparous female.—General colour grayish-black, segments three to six of antennæ, tibia and tarsi yellowish. Antennæ shorter than the body and without antennal tubercles. The lateral projections of the body are very distinct, there being three sets of large and three sets of small protuberances, the first set placed just behind the eyes, the second midway on the abdomen, and a third large pair between the base of the nectaries and the cauda. Nectaries about twice as long as wide and tapering; cauda short and thick.

Measurements.—Length of body, .79 mm.; width, .49 mm. Length of antennal segments, I, .04 mm.; II, .03 mm.; III, .12 mm.; IV, .08 mm.; V, .09 mm.; VI, .065 mm.; spur, .235 mm.; length of nectaries, .05 mm.; cauda, .08 mm.

Collected from *Cyrilla racemiflora* at Batesburg, S. C., during the summer of 1910.

Anæcia Enotheræ, n. sp.

Alate viviparous female.—General colour yellowish-green, antennæ, head, thorax and legs dusky to black. Antennæ about one-third the length of the body, with six segments, the sixth bearing a short thumb-like spur. Antennal tubercles wanting. Spur of sixth segment about one-fourth the length of the segment, the segment being slightly longer than five, and about one-half as long as three. Five slightly longer than four, and four not much longer than one or two. Third segment with three or four widely-separated sensoria, which are not as prominent as those in other species of *Anæcia*. Fourth with one or two near the distal end. Fifth with one large sensorium near the distal end and sixth with one large and several small sensoria at the base of the spur. Head broadly rounded, body short and robust, wings short and broad. Wing-veins not heavy, fore wing with two oblique veins and cubitus once forked. Abdomen yellowish, with five dorsal stripes distally placed, and a row of six or seven black spots, one each side. Nectaries are but flanged edges on a slightly raised base. Cauda broadly rounded and broader than long. Anal plate broadly rounded and merged into the abdomen. Antennæ, legs, cauda and tip of abdomen with numerous fine hairs.

Measurements.—Length of body, 1.66 mm.; width, .76 mm. Length of antennal segments, I, .04 mm.; II, .05 mm.; III, .18 mm.; IV, .065 mm.; V, .09 mm.; VI, .078 mm.; spur, .03 mm.; length of wing, 1.89 mm.; total expansion, 4.0 mm.; length of nectaries, .04 mm.; cauda, .15 mm.

Apterous viviparous female.—General colour yellow, tips of the antennæ, tibia and tarsi dusky. Antennæ six-segmented and not on antennal tubercles. Spur of sixth segment one-third as long as segment, fifth and sixth equal; four shorter than five, and third as long as the fourth, fifth and sixth together; eyes undeveloped, nectaries as in alate form. Cauda and end of abdomen a little more pointed. Abdomen with three or four dorsal stripes. Antennæ, legs and body with numerous fine hairs.

Measurements.—Length of body, 1.68 mm.; width, 1.09 mm. Length of antennal segments, I, .05 mm.; II, .05 mm.; III, .18 mm.; IV, .052 mm.; V, .065 mm.; VI, .065 mm.; spur, .03 mm.; length of nectaries, .04 mm.; cauda, .19 mm.

This species was very abundant in the cotton fields on the roots of *Enothera* sp. up to the time that the migration commenced, about the first of May. After the last of May very few specimens were to be found. A search was made for the summer host-plant, but without success. The first winged specimens were taken May 2, 1910.

Georgia, n. gen.

This genus is probably closely related to both *Schizoneura* and *Pemphigus*, and may prove to be the dividing genus. The wings are veined, as are those of the species which belong in *Schizoneura*, while the antennæ are similar to those species belonging in the *Pemphigus* group. The stem mother has five segmented antennæ, with a very short spur. Antennæ of the alate females with six segments and a short spur, segments three to five being more or less corrugated on the outer side, the corrugations being rudimentary sensoria. Front pair of wings with the cubital vein once forked. Hind wing with but a single oblique vein, which is sometimes forked about a third of the way from its base.

Georgia ulmi, n. sp.

Apterous stem mother.—General colour reddish-brown; head short and dished, body oboval in shape. Antennæ short and with five segments, the spur of the fifth being very short; third longer than the fourth, fifth and spur; eyes small and apparently simple. Nectaries are but pores, cauda very short and broadly rounded.

Measurements.—Length of body, 1.5 mm.; width, 1.17 mm. Length of antennal segments, I, .04 mm.; II, .056 mm.; III, .15 mm.; IV, .07 mm.; V, .042 mm.; spur, .021 mm.

Alate viviparous female.—General colour reddish-brown, head and thorax black, the third segment of the antennæ and the femur of each leg dusky, the remaining segments of the antennæ and the other parts of the legs are greenish-yellow. Antennæ about one-third the length of the body and not on antennal tubercles. Spur very short. Third segment as long as the fourth, fifth and sixth together, and with nine to ten transverse rudimentary sensoria or elevations along the outer side. Fourth with four to six, and the fifth with three to five toward the distal end. Forehead slightly dished, body elongate, wings hyaline, with veins slender and dusky. Fore wing with venation as in *Schizoneura*, hind wing with one oblique vein, which is sometimes forked. Nectaries are but pores, with a slightly thickened edge. Cauda triangular and short. Body with a row of small pores along each side of the abdomen, about six in number.

Measurements.—Length of body, 1.85 mm.; width, .94 mm.; length of wing, 2.4 mm.; width, 1.88 mm.; total expansion, 4.6 mm.; antennal segments, I, .056 mm.; II, .056 mm.; III, .33 mm.; IV, .11 mm.; V, .084 mm.; VI, .07 mm.; spur, .014 mm.

The pseudo-gall formed by this species is made on one edge of the leaf, and is spindle-shaped in form, being about one-fourth of an inch in diameter, and from one to two inches in length. When first formed the leaves turn yellow, and then red, after which they drop off.

Collected at Batesburg, S. C., spring of 1910.

The second generation is winged, and migrate from elm during the early summer.

THECLA CHRYSALUS, EDWARDS, AND ITS VARIETY CITIMA, HENRY EDWARDS.

BY WM. PHILLIPS COMSTOCK, NEWARK, N. J.

On pages 374 and 375 of the November issue of the CANADIAN ENTOMOLOGIST, Mr. Karl R. Coolidge says: "I can see no need of retaining *citima* Hy. Edwards in our catalogues as a variety of *chrysalus*, since it is only an individual variant." Having in my collection a very fine series of *Thecla chrysalus*, I feel called upon to answer this remark.

From a variation series of ten males and ten females which were selected from more than twice this number of specimens, I feel confident that *citima* may be held as a good varietal name for a geographical form of *Thecla chrysalus*. In many specimens the orange markings of the upper side are completely wanting, and the ground colour of the under

side is of decidedly lighter tone, which is in accordance with the original description of *citima* (Papilio I, 53), and with the type specimens in the Henry Edwards collection, with which I am familiar.

My observations of this insect lead me to believe that in the south (New Mexico and Arizona) type *chrysalus* is found predominant with the rich orange markings, while in the north (Utah), whence I have a good series of specimens, the orange markings are aborted and in many specimens entirely wanting. I think the form designated as *citima* as worthy of a varietal name as many other colour varieties of the butterflies.

In the Colorado specimens it is, moreover, not unusual to find the black patch midway of the wing on the costa entirely wanting, and also the black scales along the costa reduced to a very fine band, thus leaving the entire disc of the primaries purple. Another interesting variation is a tendency in some female specimens to have yellow spots replacing the orange found in the type *chrysalus*.

"A DECISION ON MEIGEN'S 1800 PAPER."

BY D. W. COQUILLET, WASHINGTON, D. C.

In concluding the article under the above heading, which appeared in the January number of the CANADIAN ENTOMOLOGIST, the statement is made that "the Commission did not only not decide against my contention," (*i. e.*, that the Meigen names of 1800 are *nomina nuda*), "but that the Secretary expressly says that the essential feature of the case does not lie within the jurisdiction of the Commission."

This is an extraordinary deduction, in view of the fact that in the portion of the decision quoted it is stated that "the Commission is of the opinion that the generic names in Meigen's Nouvelle Classification, 1800, must take precedence over those in his Versuch, 1803, in every case where the former are valid under the International Code."

Thus the names of 1800 are placed on the same footing as those of 1803, otherwise they could not take precedence over the latter. The status of the names of 1803 has never been questioned.

It must be borne in mind that the Commission applies the term *valid* only to the oldest available names of the various genera, not to synonyms or homonyms. In view of this fact, the statement of Dr. Stiles, that the question of the *validity* of the names rests with the specialist, becomes perfectly plain. None but a specialist could unravel the synonymy in a given group.

February, 1911

THE LITHOBIOMORPHA OF COLORADO.

RALPH V. CHAMBERLIN, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.

The records given in the present paper are based upon a study of collections made by Prof. T. D. A. Cockerell, chiefly in Boulder Co., and by the author during brief periods spent near Glenwood Springs (1904) and at Colorado Springs and Manitou (1910). The list is necessarily but partial, and when collecting for Myriapoda has been done in other sections the number of species will undoubtedly be considerably increased.

Family *Henicopidae*.

In addition to the *Lamyctes* listed below, another member of the family will in all probability be found at upper elevations in the Colorado Mts. This is *Zygethobius dolichopus* Chamb., which has been found by the author in the Uintah Mts., as well as in the Wahsatch and Sierra Nevada Ranges. It may readily be distinguished from the *Lamyctes* by its larger size, by having the posterior angles of the ninth, eleventh and thirteenth dorsal plates produced, whereas they are straight in the *Lamyctes*, and by having the tarsi all biarticulate instead of those of the first thirteen pairs being undivided.

Lamyctes fulvicornis Meinert.

Two specimens, agreeing fully with some from Wisconsin, Ill., etc., were taken by the author at Colorado Springs (Aug., 1910).

Family *Lithobiidae*.

But one genus of this family is represented by the species thus far found within the State, namely, *Lithobius*. None of the species conforms to *Monotarsobius*, which Verhoeff would separate from *Lithobius*. Probably *Vothropolys* will be found in the western or north-western parts of the State, where *B. bipunctatus* and possibly also *B. permunda* or an allied species may be expected. The following key will aid in showing the relations between species thus far known from the region.

Key to Species of *Lithobius*.

- a. Angles of the 7th, 9th, 11th and 13th dorsal plates produced.
Articles of antennæ 30-40; prosternal
teeth, 6 + 6, 7 + 7 *L. mordax* Koch.
- aa. Angles of the 9th, 11th and 13th dorsal plates produced.
b. Claw of anal legs armed with a single spine or accessory claw
at base.

- c. Claw of penult legs armed with two spines.
Spines of penult legs 1, 3, 3, 2; of first legs 1, 1, 1; claw of female gonopods entire *L. adipēs* Bollman.
- cc. Claw of penult legs armed with a single spine.
Spines of penult legs 1, 3, 3, 1; of first, 1, 3, 1; claw of gonopods of female tripartite *L. harriete* Chamberlin.
- bb. Claw of anal legs unarmed.
Coxal pores transverse; articles of antennæ 33 to 43 or more; ocelli 20 to 50 *L. forficatus* Linn.
- aaa. Angles of none of the dorsal plates produced.
- b. Claw of the anal legs unarmed.
Spines of first legs 2, 3, 1-2, 3, 2; of anal 1, 3, 2, 1; claw of female gonopods entire *L. jowensis* Meinert.
- bb. Claw of anal legs armed with one spine at base.
- c. Articles of antennæ 25-32.
Spines of first legs 0, 1, 1; of penult legs 1, 3, 3, 1; of anal 1, 3, 1, 0-1, 3, 2, 0 *L. tivius* Chamberlin.
- cc. Articles of antennæ normally 20-21. (Spines of penult legs 1, 3, 3, 2.)
- d. Spines of anal legs 1, 3, 2, 0; penult legs armed with one spine at base; spines of first legs 1, 3, 1; claw of female gonopods tripartite; length, 12-16 mm *L. dopaintus*, sp. nov.
- dd. Spines of anal legs 1, 3, 2, 0; claw of penult legs with two spines; spines of 1st legs 1, 1, 1-1, 2, 1; claw of female gonopods mostly bipartite; length, 7-8 mm *L. coloradensis* Ckll.

Lithobius mordax Koch.

A single male appearing to be this species has been examined from the State. It had lost the posterior pairs of legs. The species abounds in the States to the south-east.

Boulder Co. (Cockerell).

Lithobius adipēs Bollman.

A number of specimens, both males and females, were taken by the author at Manitou (1910). The species was known previously only from the type specimens which were from Arkansas.

Lithobius harrietae Chamberlin.

Described originally from specimens collected some miles east of Glenwood Springs (author, 1904). Several specimens of the species have also been received from Prof. Cockerell, who secured them in Boulder Co.

Lithobius forficatus (Linnæus).

Numerous specimens were obtained by the author at Colorado Springs (1910). The species will doubtless be found common in and about towns along the western sides of the mountains, and especially northward. This is the most abundant North American member of the genus, occurring throughout the northern sections, but not ranging into the southern States.

Lithobius dopaintus, sp. nov.

None of the dorsal plates with posterior angles produced.

Articles of antennæ 20.

Ocelli about 15, arranged in four series: 1 + e, 5, 3, 3. The ocelli of the most dorsal series distinctly larger than the others.

Prosternal teeth 2 + 2.

Last two pairs of coxæ laterally armed, the last three pairs dorsally armed.

Spines of the first legs 1, 3, 1; of the penult 1, 3, 3, 2, the claw armed with a single spine; of the anal 1, 3, 3, 1, the claw armed likewise with a single spine.

Coxal pores round, 4, 6, 5, 5.

Claw of the gonopods of the female tripartite; basal spines 2 + 2, apically bi- or tridentate.

Length, 12-16 mm.

Locality, Manitou (author, 1910).

About a dozen specimens were secured. Apparently most closely related to *L. socius* Chamb. of Utah.

Lithobius tivius Chamberlin.

Angles of none of the dorsal plates produced.

Articles of anteanæ 25-32, but mostly 28 and 30.

Ocelli mostly 8 or 9, arranged in two series, which form a narrowly elongate patch: 1 + 4, 3-1 + 5, 3.

Prosternal teeth 2 + 2.

None of the posterior coxæ armed either laterally or dorsally.

Spines of the first legs 0, 1, 1; of penult 1, 3, 3, 1, the claw armed with one spine; of anal 1, 3, 1, 0 (mostly) -1, 3, 2, 0 (rarely 1, 3, 0, 0), the claw armed with one spine.

Coxal pores round, 3, 4, 4, 3.

Claw of the gonopods of the female tripartite, one lateral lobe commonly small, and sometimes almost obliterated, leaving the claw bipartite. Basal spines 2 + 2.

Length, ad 8 mm.

Locality, Manitou (author, 1910).

Numerous specimens, agreeing mostly with the description above, were secured. These bring the species still closer to *L. exiguus* Meinert, from which, however, all the western specimens examined seem to present constant differences.

Lithobius coloradensis Cockerell.

Syn. *Lithobius kochii* Stuxberg, Bollman, 1888, Proc. U. S. N. M.
Lithobius kochii, var. *coloradensis* Cockerell, 1893, Tr. A.
Ent. Soc.

Lithobius kochii Stuxburg, Chamberlin, 1909 (in part), Ann.
Ent. Soc. America.

Reported from West Cliff (Cockerell, collector) by Bollman. Several specimens in bad shape, in having lost the last pairs of legs, but seeming to be this species, were secured by Prof. Cockerell in Boulder Co. and sent to the author. The specimens seen, upon careful study are found not to be identical with the California form.

Lithobius jowensis Meinert.

Syn. *L. bilabiatus* Bollman (nec Wood), 1887, Proc. U. S. N. M.
L. bruneri Kenyon, 1893, CANADIAN ENTOMOLOGIST.

No dorsal plates with angles produced.

Antennæ with 20-25 articles, the number of articles of the left antenna exceeding those of the right in the Colorado specimens examined.

Ocelli about 14, in 4 series: 1 + 4, 4, 3, 2.

Prosternal teeth 2 + 3-3 + 3.

Last three pairs of coxæ dorsally armed; last two pairs laterally armed.

Spines of 1st legs 2, 3, 1-2, 3, 2; of penult 1, 3, 3, 2; the claw armed with two spines; of anal 1, 3, 2, 1, the claw unarmed.

Coxal pores round, 3, 4, 4, 3.

Gonopods in female with the claw entire; basal spines conical, 2 + 2.

Length, 11-15 mm.

Locality, Manitou (author, 1910).

Several specimens agreeing essentially with the description above were secured.

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BOOK NOTICE.

THE DETERMINATION OF DOMINANCE AND THE MODIFICATION OF BEHAVIOUR IN ALTERNATE (MENDELIAN) INHERITANCE, by conditions surrounding or incident upon the Germ cells at Fertilization. By Wm. L. Tower (Biol. Bulletin, Vol. XVIII, No. 6, 1910).

Prof. Tower has been engaged in an evolutionary study of the genus *Leptinotarsa* since 1895. In 1906* he published extensive data concerning this group from a number of points of view. The most interesting part of the results made known at that time was the production of new forms by exposing the beetles to extreme conditions of temperature and moisture during the period of the growth and maturation of the germ cells. The new forms were bred under normal conditions, and bred true in every case. All of the new forms (or nearly so) occur under natural conditions, either as distinct species or as extreme variants (sports). The new forms were obtained in varying proportions. In the best experiment all of the progeny (those that reached the adult stage) were of the new type.

In the present article Prof. Tower has given the results of a series of experiments to determine the effect (as shown in succeeding generations) of external conditions on hybridization. Here, also, extreme conditions of temperature and moisture were the factors. The contrasted characters of the beetles crossed were such as gave under certain conditions (normal?) typical Mendelian proportions in the second generation after crossing. In crosses between *L. signaticollis* and *L. diversa* the results varied, depending upon the conditions during mating, from one in which the offspring of the first generation were all true hybrids, as shown by a splitting into three groups in the second generation, to one in which all the offspring of the first and succeeding generations were entirely like the female *signaticollis* parent. In crosses between *L. undecimlineata* and *L. signaticollis* the results were similar, but more complicated, owing to there being three pairs of contrasted characters instead of a single pair.

*W. L. Tower, Evolution in Chrysomelid Beetles of the Genus *Leptinotarsa*. Carnegie Institution, Publication No. 48.

These results, as published, are marred by contradictory statements in reference to one of the experiments. Briefly, the result of the second part of Exper. No. H 409/411 should be, and is stated to be, the same as the result of Exper. No. H 410, but the result described on p. 295 and figured in Plate III is anything but that of H 410! The article being a preliminary one, many of the details are very meagre. This is especially the case with regard to the duration of the peculiar conditions and with regard to the conditions (normal?) under which the subsequent generations were bred. The title of the article calls for peculiar (varying) conditions at fertilization. In most cases the author states that the species were crossed or mated under the conditions, but in one case he states that the eggs developed under the conditions. This permits of the results being in part purely ontogenetic. Some of the results appear to indicate this. However, the interaction between the two germ plasms might be assumed to continue throughout the ontogeny. In that case a longer duration of the stimuli would be advisable.

In the previous experiments the different kinds of progeny were isolated and bred separately (Experiments in Analysis). In another series of experiments the species were permitted to hybridize freely under diverse natural conditions, and these are called Experiments in Synthesis. Crossing between *L. undecimlineata* and *L. signaticollis* at Cuernavaca resulted finally in the complete disappearance of the former species. The same cross at Paraiso resulted in the disappearance of *L. signaticollis*.

In experiments with *L. decemlineata*, *L. oblongata* and *L. multiteniata*, conducted at four different places, a single type, which bred true, was obtained in each case, but of the types obtained no two were alike. The type at Balsas was a complex of the three species used. The type at Escamela was an intermediate between *L. decemlineata* and *L. oblongata*. The type at Tucson was a variable one, with the characters of *decemlineata* dominant. The type at Chicago appeared to be pure *decemlineata*. Subsequent cultures of these types (with the exception of the last) gave sporadic variants (2-3%), which were reappearances of "characters or combinations thereof that went into the cross." Tower compares these with DeVries' *Cenothera mutants*, and states that they behave in a similar fashion. The author maintains that the variable outcome of these crossings under natural conditions is the result, not of any process of natural selection, but of some process of hybridization, which is influenced by the external conditions. He states that this view is fully borne out by experiments in which the selective factor was eliminated.—[A. G. HUNTSMAN, Biological Dept., University of Toronto.

Mailed February 10th, 1911.