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A NEW AUTOGRAPHA FROM THE ALBERTA ROCKIES.

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Autographa Sansoni, n. sp.

Head and thorax rich olive-brown, all the crests and ridges tipped with violaceous. Abdomen dark ochreous, densely shaded posteriorly with fuscous and gray, with pinkish lateral tufts, and an anterior dorsal crest of colour of those on thorax. Ground colour of primaries of the same violaceous tint as the crest tips, shaded and reticulated with olivaceous and velvety blackish-brown, the darkest shades being in central area below the median vein, the basal and inner subbasal spaces, and a subterminal shade near apex. Basal line from costa to vein 1 nearly straight, and nearly at right angles to median vein, to which point it is double, dark-filled, the inner portion metallic, thence single. T. a. line single, metallic, sharply dentate outwardly below costa, outcurved below median vein, bordered anteriorly by a narrow dark olivaceous-brown shade, which is preceded by a narrow shade of the pale ground. T. p. line paler than ground, but scarcely metallic, except on inner margin and just below vein 2, narrowly bordered both sides by dark brown, distinct throughout its length, outcurved and slightly sinuate from costa to vein 5, almost direct to vein 2, thence slightly sinuate to inner margin. S. t. line defined by pale space between subterminal and terminal shades, undulate, with an inward sinus below vein 2. The preceding shade is dark olivaceous, shading into metallic-green between 1 and 3, blackish between 3 and 6. A pale line at base of fringes, preceded and followed by dark lunules, the anterior row being divided from the preceding olivaceous terminal area by a fine pale line. Fringes cut with dark opposite veins.

Spots finely outlined with metallic-silver, about of *californica* and *pseudogamma* pattern. Sign silvery-metallic, consisting of two lines running obliquely downwards and outwards from median vein just below reniform, coalescing at about a third of their length, and continued as a broad line slightly upcurved, of even width, blunt at extremity, almost reaching the t. p. line just below vein 2. There is a pale fulvous patch extending from just below the junction of sign to the t. p. line.

Secondaries pale lemon-yellow, with a short discal spot and a very broad blackish outer border. A fine yellow terminal line, followed by a blackish line at base of the yellow fringes, which are cut with blackish opposite veins. Beneath ochreous, densely shaded with fuscous, darkest in subterminal space, with terminal and subapical shades of olivaceous brown. The sign is reproduced in pale lemon-yellow. A small dark discal spot on secondaries.

Expanse, 35 mm. = $1\frac{3}{8}$ inches.

One perfect male, Banff, Alta., June 10th, 1910, "Imperial Bank," N. B. Sanson. Presented by him to the U. S. National Museum.

The specimen was captured, probably at light, at a low level, about 4,600 ft., and was received as No. 159, amongst some other specimens for naming. Sir George Hampson has seen it, and says that it has no nearer relation in the Old World than *P. Hochenwarthi* Hoch., from which it is very distinct.

In pattern of primaries it closely resembles *rubidus* Ott., in which the sign varies to almost exactly the sign here described. It agrees in wing form. In colour *Sansoni* is far richer, with stronger contrasts. The lines are less oblique, and though the t. a. is rather more curved, the t. p. is more direct, and is distinct throughout its length. The orbicular is smaller and narrower. The patch below the sign, which is pale fulvous in *Sansoni*, is greenish-golden in *rubidus*. In the secondaries it differs still more strikingly from *rubidus*, in having them of the pale lemon-yellow of *orophila* Hamps. and *diasema* Bdv., but with cleaner base and still broader black border than any of my specimens of these. It in no way resembles either of them as to primaries.

The species falls in *Autographa* Hubn., as characterized by Dr. Dyar in Journ. N. Y. Ent. Soc., X, 80, 1902; and like *rubidus*, which I consider its nearest ally, has not spined tibiae. In all the other yellow-underwinged Plusiids known to me the hind tibiae are strongly spined, and tibial spines exist also in several other species at present standing under *Autographa*.

DURING a fortnight's vacation spent at Fortune's Rocks, near Biddeford, Maine, at beginning of July, the following species of Lepidoptera were attracted to lights on the hotel gallery: *Smerinthus cerysii*, *Lapara bombycoides*, *Apantesis virguncula*, *Fagitana littera*, *Capis curvata*, *Datana major*, *Cochlidion biguttata*, *Caripeta angustiorata*. A couple of specimens of *Hemaris gracilis* were taken at the flowers of the Sheep-laurel (*Kalmia angustifolia*).—A. F. WINN, Westmount, Que.

THE ORTHOPTERA OF WESTERN CANADA.

BY THE EDITOR.

(Continued from page 340.)

Family LOCUSTIDÆ.

Subfamily Phaneropterinæ.

91. *Scudderia pistillata* Brunn.

MAN.—Aweme, Aug. 26, 1904, 1 ♂. (Criddle.) Also recorded from Winnipeg by Scudder (Pr. Am. Acad. Arts Sc., XXXIII, p. 277, 1898).

SASK.—Regina, Aug. 11, 1902, 1 ♂; Aug. 16, 1903, 1 ♀. (Willing.) Aug. 14, 1906, 1 ♂. (J. A. Reid.)

92. *Scudderia curvicauda* (De Geer).

MAN.—Aweme, Sept. 15, 1907, 4 ♂'s. (Criddle.)

Subfamily Conocephalinæ.

93. *Orchelimum Manitobense*, n. sp.

Nearly allied to *O. vulgare*; but differing in the smaller head, shorter pronotum, shallower elytral sinus, longer tooth borne by the male cerci, and less distinct brown stripe on the head and pronotum.

Male: Size a little smaller than *O. vulgare*; head of moderate size, fastigium of the vertex slightly elevated, somewhat less broadly rounded in profile than in *vulgare*, the apex well rounded, almost as broad as the base of the first antennal joint, without a depression above, narrowed below where it comes in contact with the fastigium of the face. Eyes of the same relative size and prominence as in *vulgare*; antennæ about three times as long as the hind femora. Pronotum rather short, feebly flaring in front, anterior margin subtruncate, posterior margin broadly arcuate. Disk nearly flat, principal sulcus distinctly impressed, metazona nearly two-thirds the length of the prozona, faintly punctate, with a shallow depression on each side of the middle line; lateral angles distinct only on the metazona, well rounded. Depth of lateral lobes about equal to their length



FIG. 17.—*O. Manitobense* male, head and pronotum.

opposite the lower margin of the eye; ventral margin rotundorectangulate, elytral sinus very shallow, the margin beneath it gently and evenly arcuate; convex callosity as in *vulgare*. Tegmina surpassing the hind femora by about half the length of the latter, considerably inflated in the proximal half, as in *vulgare*,



FIG. 18.—*O. Manitobense* male, dorsal view of head, pronotum and tympanum.

tapering distally to the narrowly rounded apices. Tympanum well developed, the principal vein strong, a little longer than in *vulgare*. Wings extending beyond the apices of the tegmina by 2-3 mm. Hind femora without spines beneath. Posterior margin of last dorsal segment broadly arcuate in dorsal view,



FIG. 19.—*O. Manitobense* male, last dorsal segment and right cercus.

with a minute median notch. Cerci equal in their proximal half, tapering distally to a blunt point, the outer margin straight; tooth on the inner face arising a little beyond the middle, at an angle of about 70° , horizontal, slender, tapering, somewhat recurved, fully half as long as the cercus. Subgenital plate large, shaped as in *vulgare*, the posterior margin obtus-angulately excavated, the styli larger than in *vulgare*.

Colour: Pale dull green; a somewhat broken brownish median band from the fastigium to the principal sulcus of the pronotum, in one individual distinct only at the lateral margins near the sulcus. Tegmina with a dark brown basal humeral streak extending to the principal vein of the tympanum, and another smaller spot of the same colour at the postero-lateral corner of the tympanum.

Female unknown.

Measurements: Length of body, 17; pronotum, 4.3-4.7; tegmen, 20-23; hind femur, 12-13 mm.

MAN.—Ashdown, July 29, 1910, 2 ♂'s. (Criddle. Type coll. Walker.)

94 *Xiphidion fasciatum* (De Geer).

MAN.—Carman, 1 ♀. (Alexander.) Aweme, July 30, 1909, 1 ♀; Aug. 9, 16, 1907, 3 ♂'s; Aug. 24, 1905, 1 ♂. (Criddle.)

Also recorded from the Red River (Scudder¹)* and Boissevain (Walker).

B. C.—Agassiz. (Walker.)

95. *Xiphidion brevipenne* Scudd.

MAN.—Red River. (Scudder.¹)

96. *Xiphidion saltans* Scudd.

MAN.—Aug. 8, 21, 1905, 2 ♀'s. (Criddle.)

SASK.—Souris River. (Scudder.²)

Both of the Manitoba specimens are brachypterous, the tegmina being shorter than the pronotum.

Subfamily Decticinae.

97. *Neduba carinata* Walk.

B. C.—Wellington. (Caudell.³)

98. *Apote notabilis* Scudd.

B. C.—Vancouver Island. (Caudell.³)

99. *Anabrus simplex* Haldeman.

MAN.—Aweme, July 15, 1904, 1 ♀ (Willing); Aug. 10, 1903, 1 ♂ (Criddle). Also recorded from Manitoba by Scudder (Psyche, VIII, p. 95, 1897).

SASK.—Radisson, July 29, 1907, 1 ♀ nymph. Also recorded from the Souris River by Scudder.²

var. *maculatus* Caudell.

B. C.—Ft. Walsh. (Caudell.³)

var. *coloradus* Thomas.

MAN.—Thomas (Bull. U. S. Geol. Surv. Terr., IV, p. 485, 1878).

ALTA.—Macleod. (Caudell.³)

The female from Aweme is rather small for the typical form (pronotum 11 mm.), and has faint indications of maculations.

100. *Anabrus longipes* Caudell.

B. C.—Nelson, 2 ♂'s. (Alexander.)

*Small numerals following an authority's name refer to same numerals in the list of references.

101. *Idionotus brevipes* Caudell.

MAN.—Aweme, July 26, 1906, 1 ♂; Aug. 1, 1904, 1 ♂; Aug. 17, 1905, 2 ♂'s. (Criddle.)

ALTA.—Calgary. (Caudell.²) Millarville. (Fletcher.³)

The specimen recorded from Calgary "was actually taken between Midnapore and Millarville, and about ten miles south of Calgary." (Fletcher.)

102. *Steiroxys borealis* Scudd.

ALTA.—Macleod. (Caudell.²)

Subfamily Stenopelmatinae.

103. *Stenopelmatus Californicus* Brunn.

B. C.—Vancouver (Brunner, Verh. zool. bot. ges. Wien, 1888, p. 211).

104. *Stenopelmatus longispina* Brunn.

B. C.—Vancouver (Brunner, *loc. cit.*, p. 260-261).

105. *Cyphoderris monstrosa* Uhler.

ALTA.—Banff, Aug. 21, 1900, 1 ♀. (Sanson.) Also recorded from this locality by Scudder (CAN. ENT., XXXIII, p. 17, 1901), Caudell (Journ. N. Y. Ent. Soc., XII, p. 52, 1904), and Walker, from Laggan by Scudder (Psyche, IX, p. 167, 1901), and from the Saskatchewan River, below junction of North Fork, by Rehn.

B. C.—Peachland. (Fletcher.³) Ainsworth. (Caudell, *loc. cit.*)

106. *Ceuthophilus gracilipes* Scudd.

MAN.—Red River. (Scudder.⁴)

107. *Ceuthophilus terrestris* Scudd.

MAN.—North Red River. (Scudder.⁴)

108. *Ceuthophilus aridus* Bruner.

SASK.—Swift Current, Sept., ♂, ♀. Regina, May 24, July 16, 1904; May 7, 1905; June 17, 20, 1907; Sept. 7, 1903, 6 ♂'s, 4 ♀'s (all immature). Mortloch, Nov. 20, 1907, 1 ♀ nymph. (Willing.)

These specimens agree closely with Bruner's description of Colorado individuals, except that the mature pair from Swift Current measure considerably larger, and are not quite uniform

in coloration as described for *aridus*, though very nearly so. They measure as follows :

Length of pronotum, ♂ 5, ♀ 4.5 ; fore femur, ♂ 6, ♀ 5.5 ; hind femur, ♂ 13, ♀ 11.5 ; hind tibia, ♂ 14, ♀ 13 ; ovipositor, 10 mm.

109. *Ceuthophilus celatus* Scudd.

B. C.—Victoria. (Scudder, CAN. ENT., XXXI, p. 118, 1899.)

110. *Ceuthophilus Agassizii* Scudd.

B. C.—Vancouver Island and "British Columbia." (Scudder.⁴)

111. *Ceuthophilus Californianus* Scudd.

B. C.—Vancouver. (Walker, Cat. Derm. Salt. Brit. Mus., 1, 202, 1869) Victoria. (Fletcher.¹)

112. *Ceuthophilus Henshawii* Scudd.

B. C.—Vancouver Island. (Scudder.⁴) Kaslo. (Caudell.⁴)

113. *Udeopsylla nigra* Scudd.

MAN.—Aweme, Aug. 31, 1904, 1 ♀ ; Aug. 31, Sept. 12, Oct. 4, 1905, 2 ♂'s, 2 ♀'s ; Aug. 30, 1906, 1 ♀ ; July 13, Aug. 20, Sept. 28, 1907, 2 ♂'s, 2 ♀'s. (Criddle.) Deloraine, July 27, 1904, 1 ♂. (Dr. J. M. David.) Elgin, Aug. 14, 1899, 1 ♂. (D. Gibson.) Also recorded from the Red River (Scudder¹).

These specimens vary from pale chestnut-brown to black, but it is impossible to separate them into two species, although the brown individuals do not seem to differ from *U. robusta* Scudd.

Family GRYLLIDÆ.

Subfamily Myrmecophilinæ.

114. *Myrmecophila Oregonensis*.

B. C.—Victoria. (Fletcher.¹) Vancouver. (Taylor, Ott. Nat., XII, 59, 1898.) Wellington, Vanc. Id. (Caudell.³)

Subfamily Gryllinæ.

115. *Nemobius fasciatus abortivus* Caud.

MAN.—Aweme, Aug. 8-31, 1904, 6 ♂'s, 12 ♀'s ; Aug. 24, 25, 1905, 4 ♂'s, 4 ♀'s, 2 nymphs ; Sept. 25, 1904, 1 ♂ ; Sept. 20, 1907, 1 ♀ ; Nov. 3, 1904, 1 ♀. (Criddle.) Elkhorn, 1 ♀. (Alexander.)

SASK.—Yellow Grass, 1 ♂; Moosomin, 1 ♂, 1 ♀; Vonda, 1 ♀. (Alexander.) Also recorded from Moose Jaw (Caudell²).

ALTA.—Medicine Hat and Calgary. (Caudell³)

The series from Aweme is very interesting, showing great variation in colour, and length of tegmina and ovipositor. Some individuals approach *N. maculatus* Blatchl., from Indiana, in all these characters, and are scarcely distinguishable except by the longer and more numerous hairs of the pronotum, but, as a rule, the ovipositor is distinctly longer than in *N. maculatus*.

116. *Gryllus Pennsylvanicus* Burm.

MAN.—Aweme, May 26, 1906, 1 ♂; June 2-24, 1904, 3 ♂'s, 1 ♀; June 12, 1907, 1 ♂; Aug. 27, 1904, 1 ♀. (Criddle.)

SASK.—Moose Jaw. (Caudell¹)

B. C.—Victoria, Vancouver. (Scudder, Psyche, IX, p. 269, 1901).

var. *abbreviatus*.

MAN.—Aweme, Aug. 8, 19, 26, 1904, 1 ♂, 2 ♀'s. Also recorded from the Red River (Scudder, Psyche, IX, p. 292, 1902).

B. C.—Near Victoria. (Walker.)

Of the four females from Aweme, the two which I have placed under var. *abbreviatus* are somewhat smaller than typical examples of this form, but the ovipositor is relatively quite as long as in the latter. The specimen taken in June is decidedly of the *Pennsylvanicus* type, while the fourth one is about intermediate between these two varieties.

The following measurements show the relation between the length of the ovipositor and hind femora in these four specimens:

Date of capture.	Length of ovipositor.	Length of hind femora.
Aug. 19	19	11
" 26	17.5	11
" 27	15.5	9.75
June 2	11.5	9

Subfamily Ceanthinae.

117. *Ceanthus nigricornis quadripunctatus* Beut.

MAN.—Aweme, Aug. 10, 1904, 2 ♂'s; Aug. 28, 1904, 1 ♀; Sept. 16, 1904, 1 ♀; Aug. 21, 26, 1909, 2 ♀'s. (Criddle.)

A NOTE ON THE LIGHT-EMISSION OF SOME AMERICAN LAMPYRIDÆ.

BY F. ALEX. MC DERMOTT, WASHINGTON, D. C.

In connection with the collection of specimens for some work on physiologic light, I have had occasion to observe the modes of light-emission of some species of American Lampyridæ common in this neighbourhood (Washington, D. C.), and thought that some of these might be of interest. The species most common here, at least within the city limits, is *Photinus pyralis* Linn.; *Photinus consanguineus* Lec., *Photinus scintillans* Say, *Photuris pennsylvanica* Geer, and *Lecontea (Pyractomena) angulata* Say, were also observed. Each of these species appears to emit its light in a different and characteristic way—sometimes in several ways.

The insect whose light-emission is best known here is the *Photinus pyralis*. This is the insect which abounds in our parks during the summer, and with whose peculiar "dipping" flight as it flashes most of us Washingtonians are familiar. This dipping flight is indulged in by the male, apparently while seeking its mate, and consists usually of a short downward flight, followed by a longer upward flight, during the whole of which the insect emits a continuous light, the whole phenomenon occupying from half a second to a second. The light appears to be at its maximum brilliancy during the turn at the lowest point of the flight, increasing rapidly on the descending flight, and decreasing on the ascending. At the completion of the flash the insect remains dark for some seconds, or perhaps minutes, and then repeats the operation, either near the same locality, or after a flight to some point usually not far from its starting point. Sometimes the light does not entirely die out immediately after the flash, but a phosphorescent glow is left shining for some seconds, sometimes till the next flash—and by this residual glow the insect may be trailed with ease at night. Later in the evening the insects fly higher, and then flash when flying straight, or, indeed, in any direction; the dipping flight appears to be indulged in only when near the earth. Occasionally they flash near the earth when flying in a curve the reverse of that described, that is, a rising flight followed by a descending one; rarely, also, they may be observed to twinkle, as will be described for the *Photuris*.

This description applies only to the male *pyralis*. The luminous organ of the male of this species occupies the entire ventral surface of the two abdominal segments next to the last, as well as a good portion, almost half, of the preceding segment. The luminous organ of the female occupies only a small spot, about a third of the ventral area, of the third

abdominal segment from the end. Although with apparently as strong wings as the males, they are heavier bodied, especially when pregnant, and fly comparatively slowly and for short distances, and their organ gives much less light than that of the male, though of the same quality, greenish-yellow. Both the male and female of this species have two small luminous points on the last abdominal segment; these points frequently present a continuous faint glow when the rest of the organ is dark, but they do not appear to be involved in the normal flash of the insect.

The larva of the *pyralis* is a narrow, sluggish glow-worm, and emits light from the ventral side of the next to the last abdominal segment. The lower side of the thoracic segments and the edges of the abdominal segments show the pink coloration characteristic of the thorax of the imago. In walking it pushes itself along with the end of the abdomen, as described below for the larval *pennsylvanica*; the *pyralis* larva, however, does not appear to have acquired the aquatic habits of the *pennsylvanica*, although it may be found in company with the latter glow-worm, in moist earth along the edge of roadways and paths.

After the *pyralis*, the most common Lampyrid here is the *Photuris pennsylvanica* Geer. This insect appears a little later in the evening than the *pyralis*, and may frequently be noticed flitting around trees and bushes just after sundown. It is usually easily distinguished from the *pyralis* by its different mode of light-emission, and the more greenish (or bluish) quality of its light. It is a much more active insect than the *pyralis*, with longer legs and a harder covering; both sexes are winged and equally active. In both sexes the luminous apparatus occupies the ventral sides of the two segments of the abdomen next to the last, and apparently a portion of the dorsal side also, since the light may be seen through the slight gap between the elytra when the insect is viewed from above. The female appears to give a slightly less intense light; at least, in mating, one insect is usually to be observed to be less brilliant than the other. The males are fighters, and on several occasions, when two or more have been imprisoned in a test-tube together, they have been known to kill one another, the insect killed being partially dismembered and the ventral portion of the thorax torn out.

The larvæ of *Photuris pennsylvanica* are broad, flat, sluggish glow-worms, rather resembling the common wood-lice; they carry two small points of light on the next to the last segment of the abdomen, and when walking push themselves along with the end of the abdomen. About one-third of the apparent width of the larva consists of broad, translucent,

horny plates, which extend outward from either side of each segment. These larvæ (*pennsylvanica*) appear to be semi-aquatic in habit; at this time of the year (early Sept.), while walking along the edge of Rock Creek, in Rock Creek Park, Washington, D. C., numerous points of greenish light, which glow slowly and then die out slowly, to glow again in a moment or so, may be seen at the very edge of the water; on investigation these proved to be the larval forms of the *Photuris* clinging to moist stones, weeds, etc., and presumably preying upon the smaller living things there. I noticed one quite remarkable sight; looking over a bridge which spans the creek just above a dam, one could see several of these points of light apparently on the surface of the water, and within a radius of about five feet, glowing and dying out again in their characteristic manner; upon closer observation there appeared to be at least a hundred of these larvæ thus apparently floating. The current here is slow, but perceptible, and as the mass of points of light did not change their position either with relation to each other or with the bridge, they must have been clinging to grasses or stones at the surface of the water. When compared at night in the same tube, the light of the larva of *pennsylvanica* is distinctly more greenish than that of the larva of *pyralis*.

The first time I saw the *pennsylvanica* in this neighbourhood, they were flitting around the tops of some rather high trees, the flight being in no particular direction. As seen there, they flashed with greater frequency than the *pyralis* ordinarily does, and the flash, instead of being a single prolonged emission, as in the latter insect, consisted of a series of several short, brilliant flashes, which may be best described as a "twinkling." This twinkling has often been observed since, and appears to be one of the methods of light-emission most commonly indulged in by this species.

Since this first observation, however, the *pennsylvanica* has been observed to emit light in several other characteristic ways. The most common of these, and probably the most common mode of light-emission of this insect, consists of a single prolonged flash, about as long in duration, and about as frequently repeated as the dipping flash of the *pyralis*, delivered while the insect is flitting around bushes and the branches of trees. The flash differs markedly from that of the *pyralis*. It begins as a faint glow, rapidly increasing in brilliancy, until it attains an intensity obviously much greater than that of the illumination of the commoner insect. It then ends suddenly, leaving an impression on the retina similar to, but of course much less intense than that produced by a sudden flash of lightning observed at night. As the maximum intensity of the light is

approached the speed of flight appears to diminish, and as the final point is reached the insect flies very slowly in a small rising helix, or, if flying straight, may come to an almost complete stop. Occasionally the flash is followed by a residual phosphorescence, similar to that observed with the *pyralis*, and rather more rarely the flash is not ended suddenly, but allowed to fade out more gradually, in a manner resembling the normal flash of the *pyralis*.

Another natural mode of light-emission of this insect consists of a single, momentary bright flash, lasting only a small fraction of a second, and delivered without respect to location or manner of flight; these flashes are apparently isolated instances of the flashes emitted by the insect when in captivity, as will be described, or of the last natural mode of light-emission which I have noticed. This last method, which I have observed only three times, consists of a vertical drop or fall of several feet—about ten feet in each of the three cases noted—during the whole course of which the insect is flashing rapidly. On the third occasion on which I noticed this falling flight, the insect continued to flit around the weeds near which he had dropped, still flashing rapidly.

In captivity the *pyralis* soon loses its luminous propensity, and attains a quiet, slow-creeping condition, in which it gives no light, or only occasional flashes. The *pennsylvanica*, however, is very restless when in captivity, running rapidly around his prison, and flashing almost continuously at intervals of about a second, these flashes never reach the full brilliancy of the natural coruscations of the insect, but are still quite bright.

The males of *Photinus consanguineus*, *P. scintillans* and *Lecontea angulata* all emit their light in short, bright flashes, apparently without relation to their manner of flight. The *angulata* emits two such flashes, separated by a fraction of a second's interval, followed by a longer interval before the next two. The *consanguineus* usually emits a single flash, much shorter and more sudden than that of the *pyralis*, sometimes followed by a residual phosphorescence, similar to that of the *pyralis*; occasionally, too, I have seen them give a twinkling light, suggestive of the *pennsylvanica*. The males of both of these species were first captured under the impression that they were the *pennsylvanica*, only the light being observed before capture. In both of these species the luminous organ of the male is confined to the ventral surfaces of the two abdominal segments next to the last. I have not yet captured a living female of the *consanguineus*; the female of the *angulata* has an organ of irregular shape, situated on the ventral surfaces of the same segments as in the male; the

light must be less intense than that of the male, but I have not observed them at night. In the cyanide killing-bottle the organ of the female *angulata* shines as four luminous points. The light-emission of the male *scintillans* is very similar to that of the *pyralis*, but shorter in duration, and not delivered during a dipping flight, but when flitting irregularly around bushes, etc. In appearance and location of the light-organ the male *scintillans* is a diminutive male *pyralis*, and from Watasé's drawings the female *scintillans* much resembles the female *pyralis*.

Dr. Frederick Knab (CAN. ENT., 1905, Vol. 37, pp. 238-239) has mentioned the difference in quality between the light of *Photinus scintillans* and *Photuris pennsylvanica*, and Turner (Psyche, 1882, Vol. 3, p. 309), has called attention to the similarities and differences between the light of *Photinus pyralis*, *Photuris pennsylvanica* and *Pyrophorus noctilucus*. Aside from the fact that the *pennsylvanica* is a considerably larger insect, and, therefore, with a larger luminous apparatus, there is certainly a distinct difference in the light. I have never submitted the light of *scintillans* to analysis with a spectroscope, but I have compared the light of *pyralis*, *pennsylvanica* and *consanguineus* with a small Schmidt & Haensch spectroscope, having an arbitrary numerical scale reading from 0 in the red (the lower end of the visible spectrum) to 65, the end of the visible violet, and on which the sodium D-line corresponds to No. 13, and the calcium lines H₁ and H₂ to 56.5 and 58.5 respectively. This little instrument resolved the light of the *pyralis* into a continuous band, extending from 5 to 25 of the scale, corresponding to the "structureless, unsymmetrical band" obtained by Ives and Coblentz (Bull. of the Bur. Standards, Wash., D. C., 1910, Vol. 6, pp. 321-336), in their excellent work on the luminous efficiency of the fire-fly. The light emitted by the *pennsylvanica* showed a shorter spectrum, extending from 7 to 24 of the scale, and that of the *consanguineus* even shorter, extending from 7 to 22 of the scale. These were single observations, which I have unfortunately been unable to more than partially confirm, but the fact that the spectrum of the light emitted by the two latter species appears to be shorter in the red end than that of the *pyralis*, would seem to account for its more decided green tinge. The red light which Dr. Knab and Mr. Barber (Proc. Ent. Soc. Wash., 1908, Vol. 9, pp. 41-43) mention as being noted in tropical species of *Phengodes*, is not regarded by Dr. Coblentz as being due to absorption in the chitin, as it would be but poor economy to generate such an efficient light, and then absorb a portion of it before its passage from the generating organ.

What the substance is that is burned to produce this light we do not know. A large number of chemicals and mixtures of chemicals have been found to give light under certain conditions, usually of oxidation. One of these (formaldehyde and pyrogallol, oxidized by strong hydrogen peroxid solution), investigated by Max Trautz (*Zeitschrift f. physikal. Chemie*, 1905, Vol. 53, pp. 1-111), produced a light whose spectrum appears to roughly approximate that of the fire-fly.

In this connection I have found that the spectrum of the light produced on moistening with commercial three-per-cent. hydrogen peroxid solution, the ground luminous tissue of the *pyralis*, which has been dried in hydrogen over sulphuric acid, extends only from 9 to 15 of the scale of the spectroscop; that is, it lies mainly in the yellow and yellow-orange portions of the spectrum.

Some as yet unfinished histologic studies indicate that the structure of the photogenic organs of *Photinus pyralis* and *Photuris pennsylvanica* are approximately the same, and much as described by Townsend (*American Naturalist*, 1904, Vol. 38, pp. 127-151), for *Photinus marginellus*.

The question naturally arises, "What is the purpose of the light-emission?" That this phenomenon has some relation to the sexual function is scarcely to be doubted. Just why this family should possess this power, while it is limited to occasional members of other families and of other orders of insects, that is, just what conditions of life and environment render it necessary as an adjunct to the sexual function, is not yet determined. Ehrenberg, in his extensive work, "Das Leuchten des Meeres" (*Abhandl. d. k. Akad. d. Wissenschaften*, Berlin, 1834-1836, pp. 411-575), agrees that, while the explanation that the luminosity is an adjunct of the sexual function is acceptable for the Lampyridæ and other bisexual forms, it will not hold for the hermaphroditic marine organisms that are luminous, while Watasé (*Protoplasmic contractility and Phosphorescence*, Biol. Lectures, Wood's Hole, 1898, pp. 177-192) seems to leave one with the impression that he regards phosphorescence as a potential property of all protoplasm. I have no further explanation to offer in this connection, but the following chance observation may be of interest:

I was looking over a fence down a sloping field, a little later in the evening than the period of greatest activity on the part of the *pyralis*. There was no sign of luminosity nearby, though some distance away several males of the *pyralis* were flying about. One of these flew towards the fence, and then dropped downward, giving his characteristic dipping flash. Immediately the less intense lights of several *pyralis* females appeared in the nearby weeds, where their presence had theretofore not

been suspected. Since observing this instance, several similar, but not so clearly defined cases, have been noticed. Barber's observations on *Phengodes laticollis* (Proc. Wash. Ent. Soc., Vol. 7, pp. 196-197), also point strongly to the relation between luminosity and sexual function in that species.*

Both sexes of *pyralis* appear to be non-luminous during copulation, but flash if disturbed.

The phenomenon would be easier to understand if only the apterous or more sluggish females were brightly luminous, while the males, as in *Phengodes laticollis*, were non-luminous, or but slightly so. But in our two species most common here the male is either considerably brighter than the female or approximately equal to his mate in brilliancy. The luminosity of larvæ is also a little hard to comprehend, except as a developmental form of a rudimentary organ. Dubois has claimed that even the unfertilized eggs are luminous.

That the light has also a protective function is also readily surmised. I have heard of at least one *bona fide* instance, where the sudden flash of a fire-fly saved him from being made a portion of the evening meal of a chicken. Between the light which they give and the sticky exudation and unpleasant odour of most species, it seems hardly likely that they would prove a tempting morsel to insectivorous creatures. Toads, it is said, have been known to eat them.

There seems to have been some discussion, in times past, as to whether the light-emission of the various luminous forms was voluntary, or at least under the control of the organism. One argument that was advanced against the view that the phenomenon was under the control of the organism was that the light of the luminous tropical elaters, cucuyo, etc., was constant, and not intermittent. Anyone who studies the natural light-emission of the Lampyridæ can scarcely help but conclude that, except when they are subjected to some powerful excitement, such as mechanical, electrical or chemical stimuli external to the organism, the light-emission is entirely voluntary, and under the control of the will. Apparently the insects of the group *Luciola* emit a continuous twinkling, which has been stated to be synchronous with the respiratory movements of the abdomen, or with the circulatory impulses of the hemolymph; such synchronism may exist, but it would hardly seem to be proof that the light-emission was not under the control of the insect's will. The cucuyo, indeed, has been observed to vary the intensity of its light apparently entirely at will.

*I regret that in this connection I have not yet been able to secure a recent paper by Meissner, "Wie leuchten die Lampyridæ?" in the *Entomologische Wochenblatt*, 1907, Vol. 24, p. 61.

LARVA OF *PTOCHORYCTIS TSUGENSIS* KEARFOTT.

BY W. T. M. FORBES, NEW BRUNSWICK, N. J.

Head and cervical shield heavily chitinized; anal plate less so. Tubercles broad. Granulations of fine sinuous lines of dots in the thinner portions, becoming polygonal patches of dots on the tubercles.

Head higher than wide, a little squarish at the top. Epicrania high, extending far above top of adfrontals and setæ i; i directly above ii and separated by only about $1/7$ height of head (measured from lower edge of clypeus to vertex); ii distant from adfrontals; six ocelli, the posterior on a level with the lower anterior, but separated by a cleft extending up from the antennal membranous area. Lower ocellus at middle of posterior edge of the antennal area. Front only $1/5$ height of head, about as high as wide, the setæ about a third way up and far apart; the punctures $1/4$ as far apart and much lower. Adfrontals broad, not extending far above top of front, with both margins evenly sinuous; i above top of front, and puncture much nearer to it than to ii. Clypeus large, with setæ far apart. Labrum slightly notched, ii higher than i, iii obliquely above iv; puncture between i and ii and higher. First free joint of maxillary palpus not as large as in *Cacacia* (Ann. Ent. Soc. Am., III, pl. 20, fig. 137); sclerites of maxilla separate, the stripes more lightly chitinized, the subgalea sending a projection between the palpifer and base of palpus; cardo large. Submentum and mentum fused, the lines of separation indicated by two parallel longitudinal slits, between which there is a chitinized area. Setæ distant. Antennæ about as in *Simethis* (loc. cit., fig. 140), but the first two joints are equal in diameter.

Cervical shield as wide as the segment, extending down to the spiracle; it may fuse shortly with the large prespiracular plate in front of it. Meso- and metathorax, with ia + ib, iia + iib; iv + v and on a level with iii. True legs moderate. On the abdomen, i and ii are on a level, distant; iii is a large ring, in the centre of which there is a small ring bearing the seta and a couple of projections; iv + v, iv minute, above and in front of v; vi single; vii consisting of an oblique row of five setæ and a sixth just behind the upper two. Prolegs not strongly projecting, with a complete ellipse of 50 hooks, alternately of $2/3$ -lengths. Anal prolegs with a bent bend of hooks, and also with extra setæ in the region corresponding to vii. On A1 and A2 vii is of 3 setæ; on A7 of two and on A8 and A9 of one only. On the ninth segment i and ii are obliquely placed, and ii are very far apart.

The outer ring of iii might be easily mistaken for a spiracle, and only occurs on the spiracle-bearing segments of the abdomen.

A NEW THECLA FROM TEXAS.

BY WILLIAM BARNES, M. D., AND J. MCDUNNOUGH, PH. D. DECATUR, ILL.

Callicista Laceyi, n. sp.

♀.—Palpi white, terminal joint shaded with black on its upper surface; antennæ black, ringed with white and tipped with orange, with a few fulvous hairs at base; front and collar white; thorax and abdomen black, with sparse grayish hairs. Upper side deep blackish-brown; primaries unmarked, with narrow white fringes shading into brown towards apex; secondaries with anal angle slightly tipped with orange, preceded by a small black patch and a few white scales; along the outer margin, between 1st anal vein and M_3 three black lunulate patches bordered towards the base of wing with white scaling; of these the third is the smallest and least prominent; a white subterminal line extends from anal angle to vein M_2 , followed by a terminal black line, which also tends to merge into the ground colour of the wing towards costa; fringes broader than on primaries, pure white, with the exception of the anal angle, where they are brown; tail single, 3.4 mm. long, bordered with white at base and tipped with same colour.

Beneath primaries pale mouse-gray, with somewhat darker terminal line and a double row of 6 terminal spots, of which the outer row is rather obscure and oval, the inner one lunate and slightly shaded with orange on lunules 4 and 5; interspace between the two rows scaled with white; well beyond the cell the wing is crossed by an irregular band composed of three distinct dashes, edged inwardly with orange, outwardly with white, and extending as far as vein Cu_2 ; of these the central dash is situated slightly nearer to the outer margin than the other two; below vein Cu_2 the band is indistinctly represented by two oblique dark gray dashes, shaded outwardly with white, and forming a broken V-shaped mark, with apex directed toward base of wing; an obscure white bar at end of cell; fringes concolorous with wing.

Secondaries mouse-gray, strongly scaled with white; dark terminal line, bordered inwardly with white and slightly enlarged at termination of veins; double row of distinct terminal lunules separated by white scaling, as on primaries, inner row becoming reduced to mere dashes towards anal angle; of the outer row, the spot between Cu_1 and Cu_2 is large; deep black and broadly margined with orange; the following spot is scaled with blue, showing traces of black only towards anal angle; anal patch black, separated from preceding spot by a narrow band of orange and

bordered internally with white; beyond the cell an irregular linear band, crossing the entire wing, and bordered outwardly with white and inwardly with orange; this band is somewhat outcurved opposite the cell, forming below the median vein a prominent W, the apices of which rest on veins Cu_2 and 1st anal respectively; an obscure geminate bar at end of cell and traces of a discal band, chiefly confined to a dark dash, edged inwardly with white near costal margin, and a similar one in the cell; dark basal spot, edged outwardly with white; fringes whitish, slightly checkered with gray.

Expanse, 22 mm.

Habitat.—Del Rio, Texas (July), 1 ♀. Type, coll. Barnes.

This species approaches *columella* Fab. rather closely in its general markings; can, however, be readily distinguished by the linear nature of the banding on the under side and the prominent W mark; in *columella* the bands are decidedly macular in character, and the ground colour of the under side is further of a much deeper brown than in our species. We take pleasure in naming the insect after the collector, Mr. H. Lacey, who has added so considerably to our knowledge of Texan Lepidoptera.

SOME INSECTS FROM STEAMBOAT SPRINGS, COLO.—II.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

HYMENOPTERA APOIDEA.—(Continued.)

Halictus vaporellus, n. sp.

♀.—Length slightly over 6 mm., black, hoary with thin pale pubescence; abdomen without band or patches; hind spur pale, with four spines, the first three long; posterior truncation of metathorax with a distinct edge only near base; apical half of mandibles dark red; flagellum slightly (variably) brownish beneath. A small species of the subgenus *Evyteus*, in all respects extremely close to *H. Foxii* Rob. (possibly a subspecies of it), but differing as follows: Stigma dusky reddish-brown; sculpture of area of metathorax considerably finer; face rather narrower. In Crawford's table (Jr. N. Y. Ent. Soc., Dec., 1907), it will not run to *Foxii* on account of the stigma, and when run to *quadrimaculatus* and allies fails to agree because of the absence of hair-patches on the abdomen. Under the compound microscope, the sculpture of the front and mesothorax is seen to agree with *Foxii*. The second abdominal segment is punctured as well as transversely lineolate.

Hab.—Steamboat Springs, Colorado, May 27, 2 ♀'s.

November, 1910

Halictus Lerouxii Lep.—1 ♀.

Halictus Cooleyi Crawford.—1 ♀.

Halictus arapahonum Ckll.—9 ♀'s.

Sphécodes (Sphécodium) nitidissimus, n. sp.

♀.—Length a little over 5 mm., very shiny; black, the abdomen bright chestnut-red, fourth segment (except extreme base), fifth and apex black; face with white hair; eyes converging below; mandibles bidentate, red, except at base; labrum entire; clypeus sparsely punctured; flagellum thick, faintly brownish beneath; mesothorax rather sparsely punctured, parapsidal grooves strong; area of metathorax regularly crescentic, very strongly defined, with irregular longitudinal wrinkles; legs black with silvery hair, small joints of tarsi becoming brownish; tegulae brown, pallid toward margins; wings gray, nervures and stigma piceous; abdomen very smooth, the second segment hardly at all punctured. Close to *S. Cressonii* Rob., but separated by the dusky wings and the regularly crescentic (instead of boat-shaped) area of metathorax. From *S. eustictus* Ckll. it is readily known by the almost impunctate abdomen.

Hab.—Steamboat Springs, Colorado, May 27, 1 ♀.

Nomada (Nomada s. str.) fontis, n. sp.

♀.—Length about 7 mm., rather slender, bright ferruginous-red, marked with black; a little yellow at lower corners of face; second to fourth abdominal segments with a small yellow spot on each side, fifth without yellow, although a pair of very faint yellowish dorsal spots can be seen on close inspection; head broad; eyes dark (not at all greenish); the scanty hair of head and thorax white; front and vertex each with a large black patch; cheeks black behind; flagellum thick, red above and below; third antennal joint yellowish in front, much shorter than fourth on outer, and somewhat shorter on inner side; mesothorax rough, with three black stripes; scutellum moderately prominent, scarcely bigibbous; metathorax with a broad median black stripe; pleura red, but above is a round red area surrounded by black; legs red, more or less suffused with blackish; tegulae red, punctured; wings dusky, with a pallid area beyond the cells; stigma ferruginous; nervures piceous; b. n. going a very short distance basad of t. m.; second s. m. receiving first r. n. about the beginning of its last third; third s. m. large, but narrowed nearly to a point above; abdomen minutely punctulate, hind margins of the segments broadly dusky, but not black; base of first segment with a blackish spot on each side; venter clear red. Close to *N. nigrocincta* Smith, and

perhaps a subspecies of it, but the abdominal bands are much paler, and the markings differ in many details.

Hab.—Steamboat Springs, Colorado, May 27, 1 ♀.

Nomada (Gnathias) bella Cresson.—1 ♀.

Andrena prunorum Gillettei Ckll.—4 ♂'s.

Andrena (Micrandrena) amplificata, n. sp.

♂.—(Type.) Length, 9 mm., or slightly over; black, with the front and abdomen very dark bluish; pubescence white, long on head and thorax, black at sides of face and on upper part of cheeks; clypeus very pale yellow, with the usual black spots, the lower edge black; head broader than long; tongue very short; cheeks ordinary; front longitudinally striate; antennæ black, third joint about as long as the next two together; mesothorax microscopically tessellate, with sparse but distinct punctures, shining in the middle; area of metathorax not defined, granular, slightly plicate basally; legs black, with white hair, slightly yellowish on inner side of tarsi; spurs dark; tegulæ dark; wings smoky; stigma large, ferruginous; nervures fuscous; b. n. falling short of t. m.; first t. c. not ending very close to stigma; apex of marginal cell on costa; abdomen with a sericeous surface, and scattered piliferous punctures only; no distinct hair-bands, but indications of a fringe on segments 2 and 3 laterally; apical ventral plate emarginate.

♀.—Length, 9 to 11 mm.; body colours as in male; hair of head and thorax above slightly ochreous; hair of face, scape, cheeks and pleura black (in large specimen pale on upper part of pleura); clypeus shining, with well-separated punctures and a median smooth line; process of labrum narrowly truncate; antennæ dark, third joint longer than next two combined; front striate; facial foveæ dark seal-brown, about half as wide as space between eye and antenna, separated from eye by only a shining line, scarcely going below level of antennæ; scutellum very smooth and shining, with scattered punctures; wings reddish; middle and hind basitarsi large and broad, with black hair; femora and tibiæ also with black or sooty hair; apical hair of abdomen soot-colour; second segment depressed nearly one-half (less in large specimen); pygidial plate triangular, narrow at apex. The large specimen differs in a few details, and might be thought distinct, but I am confident that it belongs with the others.

Hab.—Steamboat Springs, Colorado, May 27. I believe it gathers pollen exclusively from the Cruciferae, principally from *Thelypodium*. It

is a relatively gigantic representative of the group of *A. zizia*, *personata* and *pacifica*. Among the Colorado species it has a strong superficial resemblance to *A. topazana* Ckll., but is easily separated by the black hair of face and pleura, and the absence of long pale hair on the basal segments of the abdomen, the latter, in the female, being as dark and bare as that of *A. carlini*. There is another rather similar species which Viereck has named in manuscript. Three females and two males were taken. I have not seen the European *A. cyanescens* Nyl., but from the description it seems to be a related species.

Andrena Wheeleri Grænicher.—1 ♀. I have compared this minutely with a specimen from Dr. Grænicher, and cannot see any difference. My specimen has collected a quantity of bright orange pollen, which can hardly come from the Umbelliferae, on which, in Wisconsin, *A. Wheeleri* is oligotropic. A female *A. Wheeleri*, from Waldoboro, Maine, from Mr. Lovell, was collected at flowers of *Sedum acre*.

Andrena phocata, n. sp.

♀.—Length about 8 mm., black, with a dull white pubescence, long on head and thorax; head and cheeks normal; process of labrum broadly truncate; clypeus convex, very shiny, with well-separated punctures and a median mouth-band; antennae dark, third joint about as long as the next two combined; vertex and front dull and granular; distance from lateral ocelli to occipital margin hardly equal to diameter of ocellus; facial foveae bicoloured, seal-brown above, white below, occupying rather more than half space between eye and antenna, little separated from eye, going a short distance below level of antennae; mesothorax rather shiny, microscopically tessellate, sparsely, minutely punctured; scutellum shining, sparsely punctured; area of metathorax dull and roughened, not defined; legs black, with pale hair, that on hind tibiae and tarsi tinged with yellowish; spurs pale; tegulae rufopiceous; wings strongly reddish, stigma and nervures ferruginous; abdomen shining sericeous, impunctate; segments 2 to 4 with thin bands of long white hair, that on 2 broadly, and on 3 narrowly interrupted; apical fimbria shining pale yellowish; second segment depressed hardly one-third, but deeply.

Hab.—Steamboat Springs, Colorado, May 27, 1 ♀. Exceedingly like *A. fragiliformis* Ckll., but separated by the smoother area of metathorax, and the shining, more sparsely punctured clypeus and mesothorax. The bicoloured facial fovea is also distinctive. It is also allied to *A. runcinata* Ckll., but much smaller, with differently-coloured caudal fimbria, etc.

HYMENOPTERA FORMICOIDEA

The few ants I collected were kindly determined by Dr. W. M. Wheeler, as follows :

Camponotus maculatus, subsp. *vicinus*, var. *nitidiventris* Emery.

Formica rufa, subsp. *obscuripes* Forel.

F. subpolita Mayr.

F. fusca, var. *argentata* Wheeler.

F. fusca, var. *neoclara* Emery.

Lasius niger, var. *neoniger* Emery.

Myrmica brevinodis, var. near *sulcinodoides* Emery.

HEMIPTERA.

The following were kindly determined by Dr. Van Duzee :

Lygus pratensis L., var.

Thyreocoris extensa Uhler.

Irbisia brachycerus Uhler.

Thamnotettix Belli Uhler.

A NEW ALEYRODES ON AMBROSIA.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

In my garden at Boulder, Colorado, *Ambrosia artemisiifolia* L. is one of the most troublesome weeds. I thought it had nothing to recommend it, but in this I was wrong, for it supports an interesting new species of *Aleyrodes*, the pupæ of which may be found on the under surfaces of the leaves.

Aleyrodes ambrosiæ, n. sp.

Adult.—Body about $930\ \mu$ long; anterior wing, 1070 ; eyes divided; second antennal joint large; body very pale yellow, marked with gray; a gray transverse band on each side of the head posteriorly; a pair of dusky spots on mesothorax; anterior part of metathorax very dark; abdominal segments with ill-defined dusky bands. Anterior wings white, with six conspicuous gray spots, forming two transverse rows; the first row, a little before middle of wing, has two spots below the main vein and one above; the middle of the three is more basad than the others, so that they form the corners of a low triangle; the lower two spots are subquadrate, the upper is elongate and oblique, rather inclined to be divided; the second row of spots, in the subapical field, consists of two large subquadrate ones, and a longitudinal streak (more basad) between them; there is also a slight dot above the basal end of the streak, and a slight apical spot. Hind wing white, with two faint subbasal spots, the lower one more basad.

November, 1910

Pupa about 680 μ long, white, slightly suffused with ochraceous dorsally, especially the operculum, or with a distinct suffused orange patch; sides vertical, striate, margin minutely crenulate; a pair of short caudal filaments; fringe consisting of a series of curled, glassy transparent rods, about 8c-100 μ long, very easily deciduous, and always inconspicuous, so that an old pupa seems to be without a fringe; vasiform orifice normal, emarginate at apex, about 52 μ long; operculum very broad and low, about half length of vasiform orifice; lingua broad and rounded, with one notch on each side of the portion projecting beyond the operculum, and the usual apical bristles; in the subdorsal region there is on each side a series (one to each segment) of large round pores, practically as in *A. iridescens*, but beyond these, near the margin, are numerous irregularly-placed smaller circular hyaline pores, resembling the subdorsal pores of *A. glacialis*. The structure of the vasiform orifice and appendages is nearly as in *A. spiraeoides*, except that in the latter the apex of the orifice is entire, and the bristles of the lingua project. In the last-mentioned characters the new species resembles *A. Waldeni*. The spotted wings recall those of *A. Fitchi*.

Hab.—Boulder, Colorado, Aug. 13, 1910.

NOTE ON *PLATEROS COCCINICOLLIS* FALL.

This species is described by Fall in Trans. Amer. Ent. Soc., June, 1910, p. 139. The type is the *Plateros*, sp. nov., of the New Mexico list, Trans. Amer. Ent. Soc., June, 1907, p. 181. Mr. Fall also cites "Boulder, Colorado," but the specimen referred to was collected by myself in Boulder Cañon, Sept, 1907, at 7,340 ft. altitude, *Tenebrioides occidentalis* Fall, t. c., p. 128, is the *T.* sp. dub. of the New Mexico list.

T. D. A. COCKERELL.

LEPIDOPTEROUS GALLS ON SPECIES OF SOLIDAGO.

BY A. COSENS, TORONTO, ONT.

A great deal of the work done in the science of cecidology has been accomplished by observers who have been more interested in the entomological than in the botanical aspect of the subject. As a consequence of this, the host-plants affected by the various galls, in many cases, have not been specifically determined. The fact, however, that each gall is restricted to certain species of host-plants makes this side of the science an interesting and important one.

November, 1910

As the botanists are becoming more interested in the study of galls, future lists will, in all probability, contain a closer classification of the host-plants of the various galls.

In the vicinity of the City of Toronto the galls produced on *Solidago* plants by Lepidoptera are of frequent occurrence, and the various forms are closely restricted to certain species of host-plants.

In the locality mentioned, the gall produced by the moth *Eucosma Scudderiana* Clemens, is found abundantly on *Solidago Canadensis* L., and very seldom on *S. serotina*, var. *gigantea* Gray.

The moth *Gnorimoschema galliesolidaginis* Riley, produces its galls frequently on both of these species of *Solidago*; the galls on the latter host are, however, slightly less numerous.

The moth *G. asterella* Kell., produces galls which are locally abundant on *S. latifolia* L., but are found very rarely on *S. caesia*, var. *axillaris* Gray.

In the CANADIAN ENTOMOLOGIST, Vol. XLI, No. 5, p. 157, the late Dr. Brodie records the notes he has made on the gall produced on *S. caesia*. In these occurs the following statement: "There is a suspicion that the *S. caesia* gall is produced by *G. asterella* Kell." Profiting by these observations and taking advantage of the fact that the galls were comparatively numerous this season on *S. caesia*, several of the entire host-plants were removed and placed in vessels of water under bell-jars. A number of the galls produced on *S. latifolia* were taken at the same time. From Aug. 12th to 19th producers were emerging from the galls on both species of plants. Specimens of the moths, bred from each species of plant, were sent to Mr. August Busck, of the United States National Museum, Washington, D. C., and he has kindly given an authoritative classification of the producers. He states, "the gall-moths bred from both *Solidago* species are without any dispute *G. asterella* Kell."

The gall produced on *S. caesia* is quite unlike the *S. latifolia* gall in appearance, but as both galls are merely spindle-shaped enlargements of the stems of the host-plants, this difference in outward form can easily be explained. The glaucous, terete and slender stem of *S. caesia* produces a gall with glaucous epidermis, circular in cross-section and gradually tapering towards each end. On the other hand, the smooth, angled and comparatively thick stem of *S. latifolia* gives rise to a gall with smooth epidermis, somewhat triangular in cross-section. This gall has also a greater diameter and tapers more abruptly than the *S. caesia* gall,

TARGIONIA CELTIS, N. SP.

BY GLENN W. HERRICK, ITHACA, N. Y.

Scale of female.—It is nearly circular, quite convex, light gray in colour, and with the exuviae central to subcentral. The scale is thick and tough, and the ventral scale is conspicuous and entire, thus enveloping the insect in a complete shell. It is smaller and lighter in colour than the scale of *T. vitis*, and not so thick in texture. Diam., 1.17-1.47 mm.

Scale of male.—Like that of the female in colour, but smaller, less convex, thinner, and somewhat elongated.

Female.—The body is nearly circular in outline, with a broad short pygidium. (Fig. 20.) Only one pair of lobes is present, the median, but these are large and prominent. They are very close together, nearly

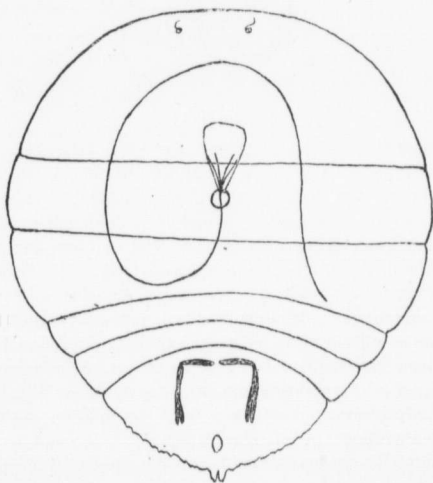


FIG. 20.

parallel on their inner margins, but obliquely rounded on their outer margins, which causes them to apparently converge. They are plainly notched on the outer margins, and sometimes on the inner margins near

the ends. The bases of the lobes extend cephalad into the pygidium by long slender chitinized processes similar to those of *T. vitis*. (Fig. 21.) There are two plates just laterad of the median lobes, two broad plates

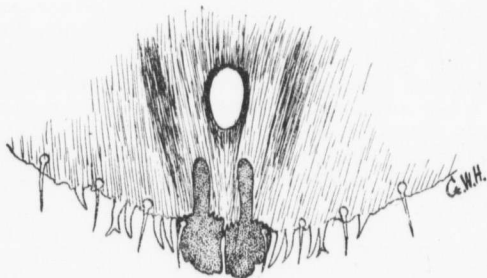


FIG. 21.

between the second and third setæ, one of which is bifurcate at the distal extremity. There is a seta on the lateral bases of the median lobes, one just laterad of the first two plates, one just laterad of the second two plates, a fourth one some distance laterad of the third, and a fifth half way to the penultimate segment. (Fig. 21.) The anal opening is low and elongate oval. There are no circumgenital pores, but there are two longitudinal chitinous bands forked at the distal extremities where the anterior and posterior circumgenital pores are usually situated, and a broken transverse band where the median group is situated. (Fig. 20.)

This scale was found on the hackberry (*Celtis occidentalis*) at College Station, Texas. I have had opportunity to compare it with *Targionia vitis* Sign., specimens of which are in the Cornell Univ. collection, and they are quite distinct.

Nearly all the specimens were parasitized, but the parasites have not been bred as yet.

NOTES ON THE GENUS *THECLA*.

T. lata Edwards.—I have taken two specimens of this rare species in the Huachuca Mountains of Cochise County, Arizona, in July of the present season, one being netted in Montezuma Canyon, through which

November, 1910

the Mexican line runs, and I believe that this will be the southern record of this species in our fauna for all time. *Læta* has been recorded from Mt. Graham, in Graham County, and has also been found in the Chiricahua Mountains. It doubtless occurs in all the ranges of Southern Arizona. Though it is well distributed, ranging from Quebec south to West Virginia, and west to Montana, from whence it comes south to Sonora, it seems to be everywhere local and scarce. Arizona *Theclas* have been very much not in evidence this year. The first broods of *blenina* Hewitson, *læta* Edwards and *spinetorum* Boisduval have been unduly scanty. *Apama* Edwards and *melinus* Hubner, however, were quite common. Of *ines* Edwards, usually an abundant species, I have only taken four or five examples. But two specimens of *halesus* have been seen, both in the Santa Rita Mountains. Dr. Holland (Butt. Book, p. 239) states that the larva of *halesus* is said to feed on various oaks. The food-plant, however, is mistletoe, upon which I have found eggs. *T. crysalus* Edwards has not appeared as yet (July). I can see no need of retaining *citima* Hy. Edwards in our catalogues as a variety of *crysalus*, since it is only an individual variant. What Mr. W. G. Wright, in his Butterflies of the West Coast, Pl. XXVII, figs. 322, b and c, figures as *T. spinetorum* is certainly not that species, but one of the *Incisaliæ*, a group that badly needs thorough revising. *T. chalcis* Behr. seems to be a pure synonym of *sepium* Boisduval.—[KARL R. COOLIDGE, Pasadena, Cal.]

CORRECTIONS TO MY PAPER ON THE TYPE-SPECIES OF THE NORTH AMERICAN GENERA OF DIPTERA.

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

The paper referred to in the above heading was submitted for publication on May 11, 1909. During the long interval that elapsed before its publication on August 4, 1910, several articles bearing more or less on this subject appeared in print, necessitating several changes. Some of these, of minor importance, were made in the proof-sheets, but others were too extended to permit of being incorporated in this manner. These and a few others to which my attention has been called, are brought together in the following notes. I desire to express my thanks to Messrs. C. W. Johnson and O. A. Johannsen for calling my attention to several of these errors and omissions.

Page 506, *Anaclinia* should be in italics, and after "Meigen" add, "Equals *Neuratelia* Rondani, 1856."

November, 1910

Page 509, under "*Archytas*," change "*Musca*" to "*Tachina*."

Page 513, under "*Besseria*," after "1870" add, "*Oedemasoma* Townsend, 1908."

Page 518, before "*Cassidemys*" insert the following :

"*Cartosyrphus* Bigot, Ann. Soc. Ent. France for 1883, p. 230, 1883, 11 species (as 12). Type, *Syrphus paganus* Meigen, the fifth species, by present designation."

Page 521, for the paragraph on *Cheilosis*, substitute the following :

"*Cheilosis* Panzer, Fauna Ins. Germ., Heft cviii, p. 14, 1809, 1 species. Type, *Musca laternaria* Muller (as *Syrphus rosarum* Fabricius). Syn., *Epistrophe* Walker, 1852; *Ischyrosyrphus* Bigot, 1882; *Lagenosyrphus* Mik, 1897."

Page 522, under *Chloromyia*, for "present designation" read "designation of Verrall, Brit. Flies, Vol. 5, 1909, p. 188."

Page 523, under *Chrysopilus*, change "*Musca*" to "*Rhagio*" and "Linnaeus" to "Fabricius."

Page 532, under *Dialineura*, change "*Thereva* Latreille, 1796," to "*Psilocephala* Zetterstedt, 1838." (This error was due to following the Katalog Palaark. Dipt. and the published descriptions of the type-species. Verrall, in his British Flies, Vol. 5, 1909, p. 552, states that in this species the face is bare, and his statement is confirmed by an examination of a specimen in the National Museum.)

Page 534, *Dipalta* should be in italics, and at the end of the second line add, "Equals *Villa* Lioy, 1864."

Under *Dipsa*, second line, *bifurcata* is not now considered as being a synonym of *lutea*; change "*Louchoptera*" to "*Musidora*," and "1803" to "1800"

Under *Docosia*, change "*Docosia valida* Winnertz," to "*Mycetophila sciarina* Meigen," and "second" to "first."

Page 539, *Epistrophe* should be in italics, and after "species" add, "Equals *Cheilosis* Panzer, 1809."

Page 544, *Exaireta*. (I do not agree with Verrall that this genus is a synonym of *Chorisops* Rondani, 1856. In the type species of the latter the palpi are minute and contained in the oral cavity, whereas in *spiniger* they are enormously developed, projecting half their length beyond the oral margin.)

Exechia should have been in black-face type.

Page 549, *Hartigia* should have been in italics, being preoccupied by *Hartigia* Schiodte, 1838. The valid name of the present genus is *Helicobia*.

Page 550, *Helicobia* should be in black-face type, and *Hartigia* in italics; the other two synonyms will be found under the latter genus.

Page 556, before *Isogaster* insert the following :

"*Ischyrosyrphus* Bigot, Bull. Soc. Ent. France for 1882, p. 68, 1882, 3 species. Type, *Musca glaucius* Linnæus, the first species, by original designation. Equals *Cheilosia* Panzer, 1809." (Our species intergrade completely with typical *Cheilosia*, that is, *Syrphus* of Verrall, etc.)

Page 657, before *Lambertia* insert the following :

"*Lagenosyrphus* Mik, Wien. Ent. Zeit., Vol. 16, p. 64, 1897, 4 species. Type, *Syrphus leiophthalmus* Schiner and Egger, the first species, by original designation. Equals *Cheilosia* Panzer, 1809."

Page 562, *Lonchoptera* should have been in italics: at the end of the third line add, "Equals *Musidora* Meigen, 1800."

Page 571, under *Mulsantia*, after "designation" insert, "Not *Mulsantia* Reichenbach, 1853," and change "*Hartigia* Desvoidy, 1863," to "*Helicobia* Coquillett, 1895."

Before *Mutilloptera* insert the following :

"*Musidora* Meigen, Nouv. Classif., p. 30, 1800. No species. *Lonchoptera* Meigen, 1803, was a change of name. Type, *Lonchoptera lutea* Panzer. Syn., *Lonchoptera* Meigen, 1803."

Page 575, before *Neurigona* insert the following :

"*Neuratelia* Rondani, Dipt. Ital. Prod., Vol. 1, p. 195, 1856, 1 species. Type, *Mycetophila memorialis* Meigen. Syn., *Anaclinia* Winnertz, 1863."

Page 578, *Oedemasoma* should have been in italics; at the end of the second line add, "Equals *Besseria* Desvoidy, 1830."

Page 581, change "*Americana* Needham," to "*Sayi* Johnson (as *Tipula annulata* Say)."

Page 585, before *Parasymmictus* insert the following :

"*Parasteinia* Cockerell, CAN. ENT., Vol. 37, p. 361, 1905. Change of name for *Tetracheta* Stein, preoccupied. Type, *Tetracheta unica* Stein. Equals *Tetramerinx* Berg, 1898."

Page 588, before *Philia* insert the following :

Philhelius Stephens, Entom. (Newman's), Vol. 1, p. 2, 1841,* 2 species. Type, *Musca citrofasciata* DeGeer, by present designation. Syn., *Xanthogramma* Schiner, 1860."

Page 595, before *Prodiplosis* insert the following :

"*Prodiamesa* Kieffer, Gen. Ins., Dipt., Chiron., p. 37, 1906, 7 species. Type, *Diamesa præcox* Kieffer, the last species, by original designation."

Page 597, under *Psilocephala*, after designation add, "Syn., *Dialineura* Rondani, 1856."

Under *Psilotanypus*, change "7" to "3"; "*bellus* Loew," to "*occidentalis* Coquillett," and "first" to "second" (the other four species were doubtfully referred to this genus, according to the two footnotes—moreover, *bellus* belongs to the genus *Procladius*).

Page 600, *Rhynchocephalus*. (Verrall, in his British Flies, Vol. 5, 1909, p. 445, separates this genus from *Nemestrina* by a character not used by previous writers—the presence of a vein between the third and fifth posterior cells in the latter genus and its absence in the former; but the one employed by Rondani, Schiner and later continental writers—the multiplicity of accessory cells in the wings of *Nemestrina*, and their absence in those of the other genus—is a far better character.)

Page 610, under *Symphoromyia*, change "1 species" to "3 species," and after "Meigen" add, "the first species, by original designation."

Page 611, under *Syrphus*, change "*Epistrophe* Walker," to "*Cheilosia* Panzer."

Page 613, under *Tetramerinx*, after "preoccupied" add, "*Parasteinia* Cockerell, 1905."

Page 614, under *Thereva*, strike out "Syn., *Dialineura* Rondani, 1856."

Page 616, before *Trichomyia* insert the following :

"*Trichocladius* Kieffer, Ann. Soc. Sci. Bruxelles, Vol. 30, p. 356, 1906, 1 species. Type, *Orthocladius fissicornis* Kieffer."

Page 619, under *Willa*, after 1869 insert, "*Dipalta* Osten Sacken, 1877."

Page 620, *Xanthogramma* should be in italics; after 91 add, "Equals *Philhelius* Stephens, 1841."

BOOK NOTICES.

THE COLEOPTERA OR BEETLES OF INDIANA: By W. S. Blatchley, Department of Geology and Natural Resources. Bulletin No. 1, State Printers, Indianapolis.

Since the publication of Dr. Holland's Butterfly and Moth Books and Dr. Howard's Insect Book, enquiries are frequently received respecting a beetle book. Hitherto there has been no work of the kind on North American Coleoptera, and it is, therefore, a great gratification to announce the publication of this monumental work by Prof. Blatchley. It is an octavo volume of 1,386 pages, and is illustrated with nearly 600 excellent drawings and photogravures.

An introductory chapter is given on the external anatomy of the Coleoptera, with explanatory diagrams. The various families of the order are then taken up, the classification being based upon that of LeConte and Horn, with the exception of the Rhyncophora, which are omitted "for lack of time and space," but which, we trust, the author will be enabled to take up in a subsequent volume. The plan of the work is to give a general introductory description of the family, followed by a key to the genera; each genus is then described in turn, and keys furnished to the species, figures being usually given to aid in recognition of the appearance or characteristics of the family or genus, as the case may be; to this succeeds a concise description of the species, with bibliographical references, localities, habits, dates of capture, etc. Nothing could well be more complete where such an immense field has to be covered. About 80 new species have been described during the course of the work. We have tested the work somewhat carefully, by taking specimens of various families and tracing out the species by means of the keys and descriptions. It has been a pleasure to do so, and to find that all necessary details are given and that the utmost accuracy prevails. A very full glossary of terms and an index to genera are given at the end of the volume.

The author has confined his work to the Coleoptera to be found in the State of Indiana, but this limitation does not impair its value for entomologists in Ontario and the States contiguous. A very large proportion of the species described are to be found within our boundaries, and the volume may therefore be safely recommended as a handbook of the order to all students in this region of North America.

The volume has been issued by the Indiana Department of Geology as a bulletin, owing to the refusal of the State Printing Board to publish

in the annual reports on the Natural History of the State, owing, no doubt, to its great size. This unfortunate decision has caused the edition to be limited to a thousand copies distributed by the Department, and 300 placed on sale by the Nature Publishing Co., 1,530 Park Ave., Indianapolis, Ind., from whom they may be procured at \$4.50 each, postage or express charges extra. Early application is recommended, as this small edition will do doubt be soon exhausted.

C. J. S. B.

THE HOUSE-FLY: A Study of Its Structure, Development, Bionomics and Economy. By C. Gordon Hewitt, D.Sc.; Dominion Entomologist, Ottawa, and late Lecturer in Economic Zoology in the University of Manchester. Manchester, 1910.

The three parts of Dr. Hewitt's valuable Monograph on the House-Fly, which were published in the Quarterly Journal of Microscopical Science in 1907, 1908 and 1909, respectively, have recently appeared in book form as a publication of the Manchester University Press. The book also includes several appendices, in which additional facts and information of much practical importance are given for the first time.

The first part gives a very full account of the anatomy of the fly, the second of the breeding habits, development and anatomy of the larva, the third part of the bionomics, allies and parasites of the house-fly and its relations to human disease. Each of these parts is concluded with a useful summary of the facts discussed, and a full bibliography. In the appendices further observations are given on the dissemination of the organisms of human disease by house-flies, breeding habits, preventive measures, etc.

The book is illustrated by nine beautifully executed lithographic plates, the first one giving coloured figures of the house-fly and several allied forms commonly met with in houses; the others illustrating anatomical details of the adult fly and of its larva and pupæ, except the last plate, on which the characters of the various flies that are associated with the house-fly and of the enemies and parasites of the latter are depicted.

A brief perusal of a few pages of the letter-press and a mere glance at the illustrations are sufficient to leave no doubt in the mind of the reader as to the high character of this work and the thoroughness and patience with which the author has prosecuted his investigations.

Now that the work is in book form, and is accessible to all, it is to be hoped that its valuable lessons will be the means of stimulating effort in the eradication of the many evils for which the house-fly is responsible.

Mailed November 11th, 1910.