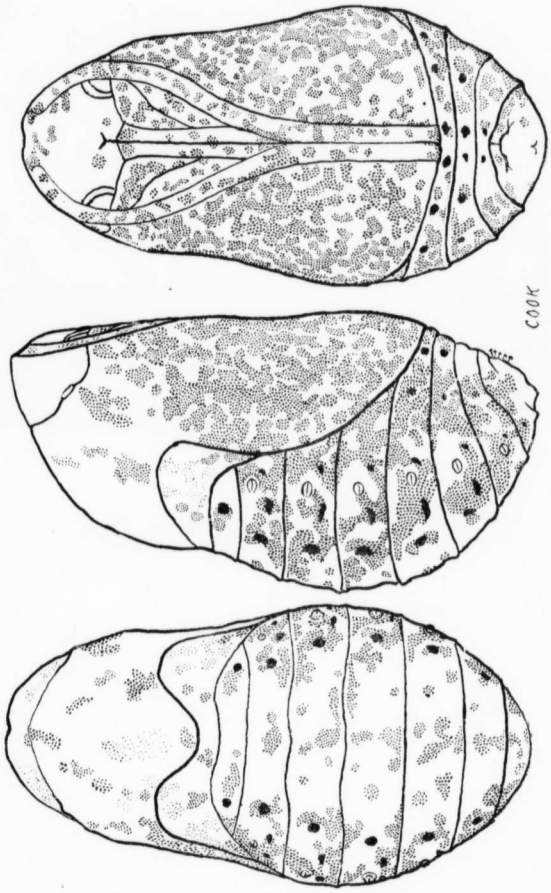

INCISALIA AUGUSTUS—CHRYSALIS.
(DORSAL, LATERAL AND VENTRAL ASPECTS.)

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STUDIES IN THE GENUS INCISALIA.

BY JOHN H. COOK, ALBANY, N. Y.

INCISALIA AUGUSTUS (continued from Vol. XXXVIII, p. 217, July, 1906).

An Error Corrected.—In 1878 Henry Edwards[1] described the mature larva and chrysalis of *Incisalia iroides* as follows:

"*Fam. Lycænidæ.*

"*Thecla iroides* (sic).

"Larva, full-grown: Carmine-red, covered with very short hair, each segment involute above, with deep double foveæ. Length, 0.50 inch.

"Chrysalis: Pitchy-brown, covered with very short bristly hair, swollen about the abdomen and much narrowed toward the head. Spiracles tuberculate. Wing-cases paler. Length, 0.40 inch."

The larvæ from which the above description was drawn were "taken near Summit Station, Sierra Nevada, July 12, 1877."

Scudder, who recognized *iroides* merely as a geographical variety of *augustus*,[2] applied Edwards's descriptions to the latter species.[3] No one hitherto appears to have questioned the propriety of this procedure, and the error has been repeated in all subsequent literature dealing with these butterflies. Comstock,[4] evidently relying upon Scudder's opinion concerning the value of the two forms, very naturally copies the mistake, and suggests that "it is quite possible that the larvæ of this species *(augustus)* in the east may have a different colour." Holland[5] also gives these descriptions as applying to *augustus*, and does not mention *iroides*. Wright[6] recognizes *iroides* as specifically distinct, but makes no mention of

1. Pacific Coast Lep. No. 27, "Transformations of Some Species not Hitherto Recorded." Proceedings of the Calif. Acad. of Sciences, June 17th, 1878.

2. Butterflies of the Eastern U. S. and Canada, p. 844.

3. Ibid, p. 844.

4. How to Know the Butterflies, p. 232.

5. The Butterfly Book, p. 247.

6. Butterflies of the West Coast, p. 210.

the larval or pupal stages observed by Edwards. Dyar (U. S. Nat. Mus. Bull. No. 52), Skinner (Synon. Cat. of the No. Am. Rhopalocera), and Smith, J. B. (List of Lep. of Boreal Am.) list *iroides* as a good species, and presumably regard it as such.

On a basis of the colours exhibited by the imago one might hesitate to separate *iroides* from *augustus*, so unreliable is the character of the ornamentation as a criterion for distinguishing between nearly related forms, especially when separated geographically. But where constant differences in size and coloration are correlated with other morphological differences, and where the larvæ are quite unlike in some particular, we are hardly justified in trying to explain the facts by assuming that both caterpillar and butterfly are subject to geographical variation, and that, despite the correlation between larval and imaginal characters within a given area, the forms are specifically identical. Even were the early stages entirely unknown, it would still be of greater advantage to regard the forms as distinct until they had been conclusively proven the same, than to regard them as the same until some one accidentally stumbled upon the disproof.

Iroides is undoubtedly a good species, and *the early stages described by Edwards do not apply to augustus.*

Previous Paper.—In 1904 I published,[7] in conjunction with Mr. H. Cook, a brief discussion of the larva and chrysalis of *augustus*, based upon a single specimen found on *Vaccinium*. The description of the mature larva there given was drawn from hasty notes made after a superficial examination during the evening of the day on which it was found. The examination was made with an ordinary reading glass, by gas light, and the notes were not referred to until the butterfly emerged. The description is faulty in two points. It was stated that the general colour was bright yellowish-green, the only markings being a faint, darker, dorsal stripe and a very minute coral-red spot in the middle of each segment just above the lateral fold. The "minute spots" spoken of are the spiracles, and of course are not present on all the segments. Moreover, they are not "coral-red," although they doubtless appeared so by contrast with the intense green surrounding them. It is further stated that the head was of a *uniform* light brown. This is also an error. The mandibles and labrum are indeed brown, but the ocellar fields are black, and the remainder of

7. CANADIAN ENTOMOLOGIST, Vol. XXXVI, p. 136 (May, 1904).

the head is nearly transparent, any colour which it may appear to have being due to the internal organs behind it.

Larva at Birth.—Pale yellow, with four series of long, recurved colourless hairs, two laterodorsal and two substigmatal; a series of short, straight, dusky, backward-directed bristles accompanying the laterodorsal series. Spiracles brownish. Head dusky-yellow above, labrum and mandibles rich brown, ocellar fields black. Length, 1.24 mm. Breadth head, .19 mm.

During the first instar the general appearance of the caterpillar alters but little. Being usually distended with food, the body appears to be nearly cylindrical, the segments smooth and rounded except for the substigmatal fold. As the first moult approaches the colour becomes tinged with green.

Second Stage.—Body onisciform, at first greenish-yellow, with a dusky dorsal stripe from the second thoracic to the eighth abdominal segment (in reality the dorsal blood vessel showing through the transparent skin) threaded by a light mediodorsal line extending to the seventh abdominal segment; a lighter cloud on the top of the laterodorsal ridge and a similar though less pronounced one on the side of the substigmatal fold, on each segment excepting the first thoracic and last two abdominal. Covered with short red-brown pile. Thoracic shield and spiracles brownish, the posterior edge of the former darker. Head (.54 mm. broad—from exuviæ) much as before.

During this stage the body becomes gradually greener until it is about the colour of young lettuce—a rather bright yellow-green quite unlike the watery pea-green of *irus* larvæ. The lighter parts of the laterodorsal ridge and the substigmatal fold do not stand out sharply, but blend with the ground colour, and form vague longitudinal stripes. Similarly coloured spots appear faintly on the sides just above the spiracle line.

Ultimate Stage.—Not differing from preceding stage at first. Later the colour deepens and becomes a vivid, intense green, with the following markings of a green-yellow: the slender mediodorsal line, broader laterodorsal and substigmatal lines—interrupted by the incisures—much as before. In addition, a series of short oblique lateral dashes, one to a segment except the first thoracic and last abdominal, fainter and usually much reduced on the second and third thoracic and on the seventh, eighth and ninth abdominal segments, elsewhere meeting the laterodorsal marks anteriorly, thus forming acute angles directed forwards; a faint cloud

around each spiracle, probably the vestige of a stigmatal stripe, as a similar spot, in line with the others, is to be found on the thoracic segments without spiracles. Spiracles yellowish-brown or buff; dorsal shield (thoracic) white or yellowish anteriorly, near the incisure livid or with a rosy tinge (possibly by contrast with the green), and studded with dark brown, slight elevations. Head above gray-green or brownish-yellow, labrum and mandibles rich brown, ocellar fields black. Pile red (?) brown—possibly also by contrast.

The body markings are evanescent, and are conspicuous for a day or two only, when the larva has attained its full growth, or a little before; they fade rapidly as the time for pupation approaches. The mediodorsal line grows fainter, and as it does so the indications of the stigmatal line appear. Then all the markings gradually fade, the line on the substigmatal fold being the last to disappear. While this is taking place the caterpillar eats little or nothing at all, the body grows shorter, the segments fill out, obliterating the laterodorsal ridges and reducing the folds and foveæ considerably. In one case the posterior half of the abdominal dorsum became tinged with dull russet-yellow, but as the chrysalis which was formed never disclosed an imago, this coloration was probably due to pathological conditions.

The Change to Chrysalis.—Having found the emergence of the pupa instructive in tracing the life-history of other species, I took precautions to witness it in the case of *augustus*. Slight peristaltic movement was noticed shortly after midnight (June 10th, 1906) in one of the larvæ fastened to its final mat. This was repeated at intervals for more than three hours, the peristalsis becoming more violent and the periods of rest less frequent, until at 3.23 a.m. the old skin split along the dorsimeson of the thorax. Three minutes later the exuviæ had been pushed beyond the body, the cremastral hooklets were fastened, and the insect was quiet.

The Chrysalis.—The newly-formed chrysalis was bright green on the head, thorax and wing-covers, gray-green on the abdomen ventrally, yellowish-white dorsally; the pulsating dorsal blood vessel (plainly visible on mesothorax, and second to seventh abdominal segments) dark green; incisures brownish-yellow; spiracles nearly white. Six series of shallow pits on the abdomen represent the principal foveæ of the larval skin; the lateral series largest, rounded; the infralateral smaller, elongate; the others minute. (See Plate 3.) The position of each pit is usually marked by a spot of black pigment beneath.

Very gradually the pupal skin hardened and became opaque; a dusky appearance was first noted about 4.30 o'clock, and at 6 o'clock this had deepened to light brown, with scattered spots of darker brown showing here and there. The number of the latter increased rapidly until 7.15 o'clock, when the pupa may be said to have attained its final characters.

In studying the chrysalis of this species I have had five specimens for comparison with twenty-two *irus* chrysalids, and from the material at hand I have been unable to discover any constant characters by which the two could be differentiated. The outline and general proportions differ in both with the sex of the inclosed insect, the female pupa being a trifle the larger, and relatively broader across the thorax. Of the two female *augustus* pupæ before me, neither is as large as the majority of female *irus* pupæ; but one of the latter is quite as small as either of the former. Perhaps the most obvious character, coloration, would be thought to present dependable criteria. This is, however, too variable to be of use; the chrysalis secured in 1903 was properly described as "dull reddish-brown, profusely sprinkled with pitchy-brown spots and irregular blotches less numerous . . . . on the wing-cases than elsewhere." I have represented in the plate a chrysalis which shows the maculation *heavier* on the wing-cases than elsewhere The colour of the spiracles is also of no value; in some cases they are straw-yellow and conspicuous, in others brown like the ground colour, and in others black. The character and distribution of the hairs (not shown in the figures) is the same in both species, as is also the "raised reticulation" covering the whole surface. There is no "slender dorsal ridge" on the thorax.

THE PRESERVATION OF PAPERED SPECIMENS.

The loss of antennæ and other damage to papered specimens and the trouble of sorting out those desired when the papers are placed loose in a box, led me to devise ways and means of protecting them from damage. Thinking that some of our readers might be interested in a method of keeping specimens in good shape, I will describe how it may be done: Secure some shallow cigar boxes and cut pieces of card to fit loosely, over the card place a narrow strip of strong paper, about two inches from one end, and then other strips at about equal distances. The paper

strips should not be too tight; under these strips the paper envelopes can be tucked. The advantages of this method are that the flap of the envelope always remains closed. The name may be seen without the trouble of removing the envelope, and with a number of cards species can be filed away in their proper order.

When packing specimens for shipment a thin layer of cotton placed between each sheet will prevent much damage in transit.

The most convenient way to keep paper for envelopes is to get it cut into the shape desired and then put up in pads. These can be carried conveniently in the collector's bag, and are always ready for use.

Trusting that these hints may be of use to some of our collectors.

J. Wm. Cockle, Kaslo, B. C.

PRACTICAL AND POPULAR ENTOMOLOGY.—No. 20.

A Homemade and Effective Insect Trap.

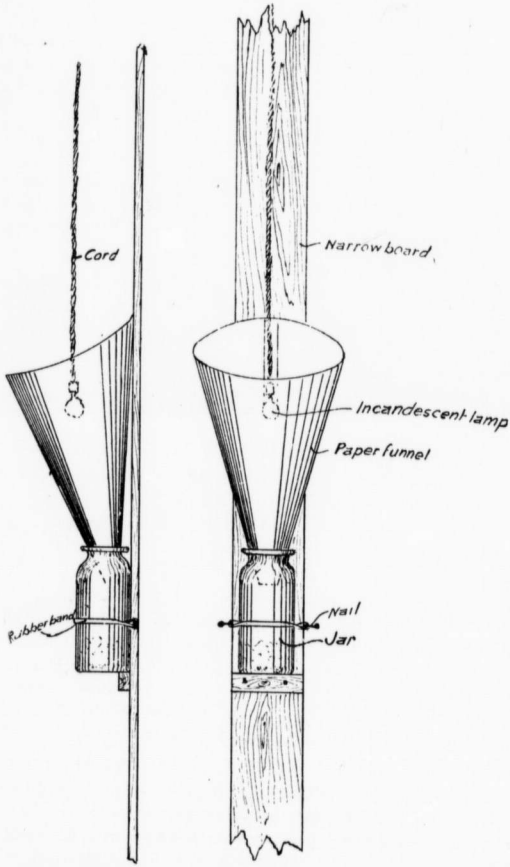
BY JOHN D. EVANS, TRENTON.

For several seasons past the writer has used an insect trap of simple construction, and with such good results that he offers the idea to anyone who may wish to try the experiment the coming season.

The light used is an incandescent lamp of 16-candle power, suspended from the cornice in front of the porch, the entrances thereto being at the sides.

The trap consists of a funnel made of a half-sheet of double elephant drawing-paper (other paper of like colour, strength and stiffness will probably answer), with the light so placed that it is just below the top of the funnel. The paper being translucent, the funnel becomes a large luminous object, and seems to be most attractive for myriads of insects of nearly all the orders. The lower part or small end of the funnel is inserted in the neck of a large wide-mouthed bottle or deep jar, into which it fits tightly and extends down about one-fourth of the depth of the bottle. In the bottle is placed a liberal supply of lump cyanide of potassium, sufficient, in fact, to cover the bottom, and then about one-third of the depth of the bottle is filled with cotton batting. Insects that once enter the bottle very rarely can escape again, and the strong fumes so quickly overpower them that fresh specimens are seldom, if ever, injured.

INSECT TRAP


Cord
Narrow board
Incandescent lamp
Paper funnel
Rubber band
Nail
Jar
SIDE VIEW
FRONT VIEW

The construction of the apparatus will readily be understood, and the application thereof, by the diagram and the following description: Take a strip of board four or five inches wide, or about as wide as the diameter of the jar, by one half inch or three-quarters inch thick, and long enough to reach up from the ground to the cornice, and when so placed it will be about five or six inches back from the suspended lamp. The funnel having been formed out of the sheet of paper, being about twelve or fourteen inches in diameter at the top and about one and one-quarter inches at the bottom and about fifteen to eighteen inches high, is secured to the strip of board with a thin narrow batten or lath nailed on the inside of the funnel and through to the board at such a height that when in place the light will be just below the top of the funnel. The bottle or jar is then put in place, with the mouth tightly fitting against the outside of the funnel, and is retained in its place by a narrow cleat nailed on the board and up against the bottom of the jar, and is kept rigid with an elastic rubber band passed around it from side to side, about half way up its height, and the band slipped over a nail driven into the edges of the board. The jar can be removed instantly at any time by simply disengaging the rubber band from the nails.

The board, with funnel attached, may be kept in some suitable place when not in use. At the approach of dusk the bottle is slipped into its place and the board set up behind the lamp, if the board is of the proper length no other means is required to keep it in place except contact with the ground and cornice. The trap is left out all night to entice all winged inquisitive individuals, and is taken down in the morning, the jar removed and stopper put in. On the approach of the following evening the contents may be removed and the trap again set. The operator will have a full evening's entertainment assorting the material of the previous night's catch, taking care of the prized individuals and noting the common species.

During some evenings insects may be much more numerous than upon others, but the writer has repeatedly noticed that no matter how unpropitious the early part of the evening may be, the morning may find some highly-prized object an inmate of the trap, and by keeping up the trap-setting nightly, from early until late in the season, one is enabled to capture not only the transient fliers, but also to note the dates of the coming and going of those species which are on the wing for a lengthened period.

The details of installing the trap may of course be varied to suit the requirements of the situation.

NEW MICRO-LEPIDOPTERA.

BY W. D. KEARFOTT, MONTCLAIR, N. J.

(Continued from page 128.)

Eucosma Hamptonana, sp. nov.

Expanse, 12.5 to 14 mm.

Head very pale fawn; palpi white fawn, with a darker dusting on outside; antenna dark fuscous, fawn-white between joints; thorax darker fawn than head, posterior half streaked with blackish; abdomen grayish-fuscous, anal tuft with an ochreous tinge; legs whitish-gray, anterior pair dusted with fawn above, and tarsi ringed with black.

Fore wing light tawny-fawn, with a large white dorsal spot, white dashes on costa, and strigulated with black on costal and dorsal margins. The basal area is limited on lower half of wing by white dorsal mark, on upper half it is not clearly defined; on the fold are two black dots, and the male costal fold, which extends to middle of wing, is marked with black dashes, with a corresponding line of blackish dots below; the dorsal margin is similarly marked with black dashes, and the inner edge of the white patch is outlined with black. The white dorsal patch is large, extending from middle of dorsum to tornus, beneath ocellic spot, with two or three dark dots on lower edge; the inner edge curves obliquely outward to above middle of wing, it then follows fold to tornus; outwardly it is somewhat overlaid with fawn and black scales. Between the white patch and costa is a gray shade; beyond this the costa is marked with four long geminate lines, white on costa and shining gray below. Each encloses a small black costal dot, and is separated by a larger black spot; the line below apex curves outward in termen, ending in a white dot below apex. The ocellic area is large, the vertical bars purplish-gray-metallic, the inner is double the width and length of the outer, and above connects with the inner pair of costal lines, below it expands outward beneath the ocellus; in the fawn-coloured ocellus are four or five short black lines and dots, and there is a patch of black on the inner side of the inner bar. Terminal line black, cut with white below apex. Cilia shining leaden-gray.

Hind wing smoky-gray, darker at apex. Cilia whitish, with a darker basal line. Under side yellowish-gray. Under side fore wing dark smoky-gray, blackish towards termen; costal spots repeated.

The description is from a ♂ specimen; the ♀ differs in that the dorsal patch is gray instead of white; the ♀ is also darker, black and brown scales overlay the fawn.

May, 1907

Five specimens: Hampton, New Hampshire, July 7 to Aug. 5, S. Albert Shaw.

Enarmonia Shawiana, sp. nov.

Expanse, ♂, 11.5 to 12 mm.; ♀, 9.5 to 14.5 mm.

Head light olivaceous brown on top, darker on sides, white in front; palpi, ♂ pure white; ♀ cream-white; the outer end of tuft and apical joint smoky-brown; the ♂ palpi are shorter than ♀; antenna fuscous; thorax dark brown in middle, the patagia and an anterior band of grayish-brown, a few whitish specks on posterior end; abdomen dark velvety-brown above, anal tuft gray; legs grayish-white, shaded in front with blackish-brown.

Fore wing blackish-brown with a bronzy-tinge, a conspicuous white dorsal mark and four white costal dashes in outer half. The basal area extends to inner third, its outer edge is generally rounded with indentation at upper and lower fourths; on this lower half is a small patch of white scales, above which a streak of bluish-metallic nearly touches costa. The white dorsal mark is in middle of wing, it is irregular in form, in some specimens with a slight spur from its outer upper corner, in others it is somewhat bifurcated at the upper end with a few dark scales on dorsum; in all specimens it slightly angles outward, and rarely reaches above fold; an inwardly inclined fascia of shining-blue continues from its upper edge to costa, ending on costa as a geminate white spot. Beyond this is a broad fascia of the ground colour, thickly dotted with dull black on costa, and more sparsely on upper half below costa, and lightly with olivaceous-brown on lower half. The outer half of costa is marked with four large white oblique costal streaks, the one before apex is the largest, and in some specimens it is geminate; the inner costal dash sends a curved leaden-blue-metallic line to anal angle, its lower half broadening and forming the inner vertical ocellic bar. Beyond this metallic line the ground colour is coppery-brown, horizontally streaked with black, between the white costal dashes the costa is narrowly edged with black. From the second and third costal dashes a similar leaden-metallic line curves under the apex before the termen, and ends in termen as a white dash about a third above tornus. The outer costal dash is edged below with leaden-metallic scales, opposite its lower end, but not joining it is a white dash below apex. The ocellic area between the two metallic bars is bright coppery-brown, crossed by four or five horizontal black lines, with an indistinct metallic line below. Terminal line black, cut with white dashes below apex at lower third and twice on tornus. Cilia white at apex, leaden-gray below, preceded by a whitish basal line.

Hind wing dark smoky brown, blackish-brown outwardly. Cilia whitish-gray, with a black basal line. Under side both wings grayish-brown, costal spots of fore wing repeated.

Described from two ♂ and seven ♀ specimens. Essex County Park, N. J., July 1 to 17; Newark, N. J., June 9, A. J. Weidt; Hampton, N. H., June 10, S. Albert Shaw.

The New Hampshire specimens are all large, the ♂ 11.5 to 12 mm., and the ♀ 14 to 14.5 mm. One of the New Jersey specimens, from Newark, a ♀, is 13 mm., and seems to be of the same race as those from New Hampshire; the other four New Jersey specimens, all ♀'s, are of a much smaller race, expanding 9.5 to 10.5 mm.; I was inclined to separate them, but most minute examination fails to show any specific difference. This species is closest to *E. bracteatana*, Fern., and the larvæ are likely to be found in the cone scales of some of our eastern Conifera, as is the habit of Fernald's species in California.

Named in honour of Mr. S. Albert Shaw, of Hampton, New Hampshire, to whom I am indebted for a great many carefully-collected and exquisitely-mounted specimens.

Proteopteryx Marmontana, sp. nov.

Expanse, 12.5 to 18 mm.

Head brownish gray; palpi dark gray, paler within; thorax bronzy-black, posterior end and patagia streaked with white; antenna and abdomen dark fuscous; legs whitish, dusted and banded with bronzy-black.

Fore wing: Inner half bronzy-brown, heavily overlaid with gray, the ground colour gradually becomes lighter outwardly, until in the apical third it is bright coppery-brown or ochreous. There is a large white dorsal spot between inner and outer third on lower half of wing, dotted with blackish-brown on dorsal edge, and in some specimens a few dark scales above; the inner edge is outwardly oblique and indented below fold, a short spur follows fold on its outer edge, but excavated beneath. Above this spot a broad double geminate gray fascia continues to costa. The basal area outlined by this fascia and dorsal spot is edged with black scales, in the middle of its lower half is a grayish shade. Beyond the fascia and dorsal spot is a curved coppery-brown fascia, black on costal edge, dotted with black below fold and on dorsal edge, and a few black scales on its outer edge before the ocellus. Beyond this a pair of geminate costal spots send a double geminate band of shining-gray to ocellus, the latter pure white, shining on the sides and mixed with a few shining gray scales, the centre is tinged with ochreous and crossed by three horizontal black lines in the upper half. There are two other

geminate costal dashes between the above and apex, the inner sends a horizontal gray-metallic line to termen beneath apex, it nearly joins a shorter leaden line from the outer dash. The costal dashes are narrowly white on costal edge, each contains a small black costal dot, and between each two the costal edge is narrowly black. Cilia brown at apex, gray in middle of termen and whitish around tornus.

Hind wing light smoky-gray, cilia whitish-gray, with a faint darker basal line; under side the same. Under side fore wing dark gray, costal spots faintly repeated.

The description is from a ♂ specimen from Rounthwaite, Manitoba. The New Hampshire specimens are smaller, and more of a dark browish-hue inwardly and ochreous outwardly. Without a lens the Manitoba specimens look almost black in the inner half.

Twenty-one specimens: Rounthwaite, Manitoba, July 11 to 15, L. E. Marmont; Aweme, Manitoba, July 12 to 24, Norman Criddle; Prince Albert, Alberta, July 19, T. N. Willing; Regina, Assiniboine, July 15, Dr. Jas. Fletcher; Hampton, New Hampshire, Aug. 5 to 10.

This species is nearest *P. momonana*, Kearf., it can be separated by the ocellic spot, which in *Marmontana* has a well defined dark dot in its upper half, also by the inner edge of the ocellus, which in *Marmontana* is straight, while in *momonana* it sends a spur into the dark fascia before it.

I take pleasure in naming this interesting and well-distributed species after Mr. L. E. Marmont, to whom I am indebted for a great many beautifully-prepared specimens of Micro-Lepidoptera.

Epinotia Normanana, sp. nov.

Expanse, 9 to 10.5 mm.

Head and palpi whitish fawn, latter with blackish-brown shade on outside of second joint; antenna grayish-white; thorax light fawn, a faint dark shade in middle of posterior half; abdomen silvery-gray, anal tuft light cinereous, with a few dark scales at its base; legs whitish-fawn, dusted and banded with dark brown.

Fore wing very light fawn, mixed with whitish scales, with large, well-defined black costal dashes, terminal line and dusting. The basal area is only defined on the lower two-thirds of wing, when it reaches to inner third the area is pale fawn, with three vertical black lines on its outer half, the inner only reaching costa, and one black vertical line in the middle of the inner half, with a black dot between latter and base and a slight dusting of black between these lines on the dorsal half. The costa, from base to apex, is evenly marked with black dashes, the three before

apex being very large, triangular in shape and oblique ; they are separated by white costal spots, each containing a small black costal dot ; the outer white spot sends a white line into termen below apex, through black terminal line into cilia, it encloses a blackish apical spot. The pearly-white, shining ocellic bars are joined together below, and enclose a narrow fawn space, dotted with black, above it is a larger black shade. On the outer third of dorsum is a shining pearly-white dot ; between it and the inner ocellic bar the ground colour is rather heavily powdered with black. There is a broad central fascia of ground colour, edged inwardly with white, and in middle near dorsum dotted with black, and a few blackish scales scattered through the centre. Terminal line black ; cilia leaden-metallic.

Hind wing gray ; cilia paler gray, with a darker basal line. Under side the same. Under side fore wing darker gray, costal spots faintly repeated. Cilia leaden-metallic, with black basal and terminal lines.

Fourteen specimens : Aweme, Manitoba, all collected June 27, 1905, by Mr. Norman Criddle, in whose honour the species is named.

Epinotia Kennebecana, sp. nov.

Expanse, 13 to 15 mm.

Head light fuscous ; palpi cream white inside, light fuscous outside, apical joint dark fuscous ; thorax dark fuscous, tips of patagia light gray ; abdomen fuscous, anal tuft cinereous ; legs cream-white, shaded with dark brown.

Fore wing : Basal area blackish-brown, a dark gray shade extends from basal area along costa to apex, and is continued as a narrow black terminal line to tornus. Enclosed in these dark and gray shades, the entire outer two-thirds of wing are white ; the usual white dorsal spot and an abnormally large white ocellic spot joining together, but their relative positions indicated by a shade of scattered gray and black scales between them. The basal area on dorsum extends to inner third, its outer edge is slightly outwardly oblique to above middle of wing, then obliquely inward to costa ; the lower two-thirds is finely dentate. The gray costal shade is marked with four paler geminate spots on the outer half, and before the apex the gray and white is shaded with a yellowish-coppery tinge. The ocellic spot is defined on both sides by vertical shining white bars, each outlined with black scales. Cilia black, divided by a gray line on lower half.

Hind wing light smoky-gray, cilia paler, with a gray basal line. Under side grayish-white, shaded with brown along costa. Under side fore wing smoky-black, costal spots faintly repeated, grayish-white below fold.

Three specimens: Kennebunkport, Maine, August, collected by G. H. Clapp. In collections of Carnegie Museum, Acc. Cat. No. 2351 and 2861.

Co-type in Carnegie Museum.

Acleris albilineana, sp. nov.

Expanse, 21–23 mm.

Head, palpi, antenna and thorax dark hoary-gray, with a purple reflection; posterior end of thorax and patagia ferruginous-purple; abdomen gray, anal tuft dull ochreous; legs grayish-white, dusted and banded with dark brown and ochreous.

Fore wing dark grayish-lavender, with a conspicuous pure white band from base to costa before apex, on the upper third of the wing. At the extreme base the band begins on the costa, but does not touch it again, except at the outer end; the sides of the band are parallel, and it only diminishes in thickness just before the outer end. Above the white band is a costal band of ground colour of about the same width. Below the white band and outlining it the ground colour is darkened by deeper purple and black scales, and with four or five dots of black raised scales in the middle of cell, sometimes with a ferruginous shade. There are three black dots of raised scales in fold, the larger at inner third, another at outer third, and the smallest at outer end of fold. Cilia concolorous.

Hind wing bright shining gray, with a yellowish hue, cilia the same; under side the same, but speckled with dark brown. Under side fore wing shining cinereous-gray, paler along costa.

Ten specimens, Ottawa, Canada, Sept. 23 and April 21, C. H. Young; Hampton, N. H., Oct. 18 and 20 and Mar. 28 to May 2, S. Albert Shaw.

This species is very much like *Acleris divisana*, Hbn. I have not seen the European species, but if Robinson's figure 63, Pl. vii, Trans. Am. Ent. Soc., Vol. II, 1869, is a good representation of it, *albilineana* can be separated by the following differences: white band does not reach apex; white band is straight on its lower edge, not angulated; white band does not touch costa except at its two ends.

Archips argyrospila, Walk., variety *mortuana*, var. nov.

Expanse, 18 to 20 mm.

Head dark bronzy-gray, collar shaded with pale ochreous; palpi pale ochreous inside, brown outside, terminal joint blackish; antenna gray; thorax shining-gray; abdomen slightly paler than thorax, tuft whitish-gray; legs ochreous-white, heavily dusted in front with bronzy-black.

Fore wing: Shades of light and dark gray. There is an inner fascia of shining gray, beginning on costa as a quadrate white spot between inner fourth and third, below costa it widens, and at dorsal margin it extends from inner fourth to beyond middle; in male specimens the dark grayish-brown costal fold partly hides the white spot. There is a similar quadrate outwardly oblique white spot between costa and top of cell beyond middle, below cell it continues as a shining-gray fascia, and overspreads the outer third of wing. A smaller inwardly oblique white spot is on costa before apex; these two white costal spots enclose a darker shade of gray, and in some specimens there is a paler shade connecting the two spots below the dark spot. Cilia pale, shining gray.

Hind wings gray, cilia whitish; under side whitish. Under side fore wing smoky-gray, paler around margins, with costal spots repeated.

Four specimens: Ottawa, Canada, July 3, C. H. Young; New Brighton, Pa., June 20, F. A. Merrick; Wisconsin; San Francisco, Cal. (Strecker collection). I have two other specimens, one from Algonquin, Ill., June 29, Dr. Nason, and one from So. Utah, July, Dr. Barnes, too badly rubbed to include in the type material.

The maculation does not differ from *argyrospila*, but there is a total absence of red, brown or ochreous shades, these being entirely replaced by grays. The variety seems to be as widely distributed as the common form.

Phalonia Hollandana, sp. nov.

Expanse, 13 to 14 mm.

Head, palpi and thorax cream-gray, dusted with light brown; antenna gray; abdomen dark gray, anal tuft dull ochreous; legs cream white, dusted with brown in front.

Fore wing: Basal area cream-white, mottled in the middle with light olivaceous and edged on costa with pale purplish-pink, in which are a few brown dots; its outer margin is nearly straight and very oblique, extending from inner fourth of dorsum to beyond inner third of costa. Beyond it is a black fascia, narrowest on costa, overlaid in middle with purplish-brown, and on lower end with pinkish and cream-white scales; its outer edge is concave, and encloses a large round spot filling the outer third of wing, edged with shining-purple and interior dull reddish-purple, shaded with black outwardly and above. The outer half of costa is purple, interrupted by a black spot before apex, which sends a narrow black fascia into the round spot. There is a black patch in apical cilia, and five others in the termen cilia; between these black spots the cilia is ochreous-pink, and is preceded by a fine black line, before which is a whitish line.

Hind wing blackish-gray; cilia paler, with a broad darker line close to base; under side dark gray, mottled outwardly with black in middle of wing; cilia preceded by a fine ochreous line. Under side fore wing smoky-black, dotted with cream-white on outer half of costa.

Three specimens: Oak Station, Allegheny Co., Penn., Sept. 1, Fred. Marloff; Pittsburg, Penna., Sept. 12 and 21, Carnegie Museum, Acc. No. 2960, through Dr. W. G. Holland, in whose honour the species is named, and to whom I am indebted for the privilege of studying and identifying a large number of most interesting specimens of Micro-Lepidoptera.

Commophila contrastana, sp. nov.

Expanse, ♂, 20 mm.; ♀, 21 mm.

Head and palpi cream-white; antenna, basal joint white, shaded with brown; outer joints light whitish-fuscous; thorax and patagia purplish-black, with an iridescent blue and red reflection; abdomen and legs ochreous-cream, latter shaded in front with brown.

Fore wing: Upper half and outer third cream-white; a sharply-defined band of bluish-black, with an iridescent reflection, as on the thorax, occupies the dorsal edge of the wing. This band begins on costa, covering the inner sixth; it covers the basal area, the outer edge, is outwardly oblique to lower third of wing, where it curves and continues parallel to dorsum; the band is slightly wider at outer end, and terminates before the ocellic space. Paralleling the apex in the outer fourth is a shade of light olivaceous-fuscous, with a cluster of leaden scales before apex, divided into four lines by shining-cream strigulæ from the costa. Between middle and outer third there is a quadrate spot of same shade on costa. Cilia cream-white.

Hind wing light brownish-fuscous, darker around margin; cilia whitish; under side ochreous-white. Under side fore wing light ochreous-brown; shining gray-white below fold.

One ♂, Oak Station, Allegheny Co., Penn., May 23, Fred. Marloff; one ♀, New Haven, Conn., June 7, A. E. Britton.

This species is very closely allied to *C. fuscodorsana*, K., and may prove to be the eastern form of this western species. The dorsal band in *fuscodorsana* sends a spur up to end of cell at its outer end; the strigulations in apex are much darker and limited to two well-defined broader lines. The shade of the dorsal band is fuscous-brown.

Correction.—On pages 5 and 6 *ante* read, "University of Kansas" in the place of "Kansas Academy of Science."

(To be continued.)

LIST OF HEMIPTERA TAKEN AT COMO, QUEBEC.

BY GEO. A. MOORE, MONTREAL.

The following list enumerates the Hemiptera taken by me at Como, Quebec, which is about 30 miles west of Montreal, from the 1st of July to the 3rd of September, 1906. All these insects passed through the hands of Mr. E. P. Van Duzee, who kindly named them for me. The dates given are the first day the insect was seen or taken:

HETEROPTERA.

Pentatomidæ.

Corimelæna unicolor, P. B.—Aug. 19. Common on Golden-rod.
Corimelæna pulicaria, Germ.—July 24. Common on Golden-rod.
Eurygaster alternatus, Say.—July 26. Several.
Sehirus cinctus, P. B.—July 24. One specimen.
Euchistus fissilis, Uhl.—July 26.—Several.
Euchistus tristigmus, Say.—July 2. Several.
Pentatoma juniperina, Linn.—July 21.—One specimen.
Mormidea lugens, Fab.—Aug. 1. Several.
Cœnus delius, Say.—Aug. 4. One specimen.
Neottiglossa undata, Say.—July 26. Several.
Cosmopepla carnifex, Fab.—July 1. Common.
Menecles insertus, Say.—July 26. One immature specimen.
Banasa dimidiata, Say.—Aug. 12. One specimen.
Podisus modestus, Dall.—Aug. 18.
Elasmostethus atricornis, Van D.—Sept. 1. Common.

Coreidæ.

Alydus eurinus, Say.—July 20. Several sweeping.
Alydus 5-spinosus, Say.—July 26. Three specimens taken sweeping.
Protenor Belfragei, Hagl.—Aug. 2. Two specimens taken sweeping.
Corizus novæboracensis, Sign.—July 27. Several sweeping.
Corizus nigrosternum, Sign.—July 8 and Sept. 3. Several sweeping.

Berytidæ.

Zalysus muticus, Say.—July 26. Common on Raspberry.

Lygæidæ.

Nysius angustatus, Uhl.—July 24. Common.
Nysius longiceps, Stal.—July 25. Two specimens taken sweeping meadow.
Cymus claviculus, Halm.—July 2. Common in swampy places.

Œdancala dorsalis, Say.—July 15. Common sweeping railroad track.

Ligyrocoris diffusus, Uhl.—July 14, Aug. 11. Common.

Ligyrocoris contractus, Say.—July 26. Several.

Perigenes constrictus, Say.—Aug. 3. Three specimens taken.

Lygæus Kalmi, Stal.—Sept. 3. Two specimens taken on milkweed.

Phlegyas abbreviatus, Uhl.—July 26. Several sweeping railroad track.

Scolopostethus Thomsoni, Reut.—July 2. One specimen.

Tingitidæ.

Corythuca juglandis, Fh.—July 24, Aug. 1. Common on Oak and Elm.

Corythuca marmorata, Uhl.—July 26. Two specimens on Oak and Elm.

Aradidæ.

Aradus abbas, Prov.—July 1. One specimen.

Phymatidæ.

Phymata erosa Pennsylvanica, Hand.—July 14. Common on Golden-rod.

Reduviidæ.

Coriscus subcoleoptratus, Kirby.—July 1, Aug. 4. Several.

Coriscus ferus, Linn.—July 2. Very common.

Coriscus inscriptus, Kirby.—Aug. 14. One specimen

Sinea diadema, Fabr.—July 26. Very common on Golden-rod.

Diplodes luridus, Stal.—July 21. Immature on Elm trees.

Reduvius personatus, Linn.—July 29. Three came to light.

Anthocoridæ.

Anthocoris musculus, Say.—July 25. Common on shrubs.

Triphleps tristicolor, B. White.—July 2.

Capsidæ.

Plagiognathus obscurus, Uhl.—July 2.

Plagiognathus politus, Uhl.—July 15.

Plagiognathus annulatus, Uhl.—July 2.

Rhinocapsus Vanduzei, Uhl.—July 25.

Diaphnidia pellucida, Uhl.—July 15.

Orthotylus chlorionis, Say.—July 8.

Hyaliodes vitripennis, Say.—July 20.

Dicyphus agilis, Uhl.—July 8. Common.

Dicyphus famelicus, Uhl.—Aug. 3. Common.

Stiphrosoma stygica, Say.—July 1, Aug. 12. Common.
Halticus bracteatus, Say.—July 18. Common.
Pilophorus crassipes, Stal.—July 24. Two specimens.
Pilophorus amœnus, Uhl.—Aug. 4. One specimen.
Monolocoris filicis, L.—July 2. Very common.
Resthenia insignis, Say.—Aug. 3.
Lopidea media, Say.—July 26. One specimen.
Phytocoris eximus, Reut.—July 15. Common.
Phytocoris puella, Reut.—Aug. 2.
Phytocoris pallidicornis, Reut.—July 14.
Calacoris rapidus, Say.—July 1. Common.
Melinna modesta, Uhl.—July 20, Aug. 1.
Lygus pratensis, Linn.—July 1. Very common.
Lygus invitus, Say.—July 14. Common.
Lygus pabulinus, Linn.—Sept. 1. One specimen.
Orthops scutellatus.—July 7.
Pœcilocapsus lineatus, Fabr.—July 1. Common.
Pœcilocapsus goniphorus, Say.—July 8.
Pœcilocapsus marginatus, Reut.—July 8.
Camptobrochis nebulosus, Uhl.—July 21.
Neoborus saxeus, Dist.—July 21.
Capsus ater, Linn.—July 8.
Collaria Meuilleuri, Prov.—July 15. Common.
Trigonotylus ruficornis, Fall.—July 2.
Miris affinis, Reut.—July 2. Common.
Leptoterna dolabrata, Linn.—July 1. Common.
Fourteen species of Capsids not determined.

Saldidæ.

Salda pallipes, Fabr.—July 7. Common on shore.

Notonectidæ.

Plea striola, Fieb.—July 31. Common.

Gerridæ.

Microvelia Americana, Uhl. ?—July 31. Immature; common.
Gerris marginatus, Say.—July 23. Common.
Gerris sulcatus, Uhl.—July 31. Common.
Limnoporus rufoscutellatus, Lati.—July 31. Common.
Mesovelia bisignata, Uhl.—Aug. 1. Common.

(To be continued.)

THE *EUPITHECIÆ* OF EASTERN NORTH AMERICA.

BY GEO. W. TAYLOR, WELLINGTON, B. C.

In the present paper an attempt is made to enumerate the species of *Eupithecia* occurring in the eastern parts of North America.

The species of this genus, being very numerous and not very easy to distinguish the one from the other, have been neglected by most entomologists, and in the majority of collections they are present in short series only, and usually under incorrect names.

The Monograph of Dr. Packard, which for so many years was our only guide, enumerated but 17 species from the whole of North America. Naturally it was impossible to identify one's captures from that work. Then came Dr. Hulst with 40 or 50 new species, but I am compelled to say that his descriptions are in most instances altogether inadequate, and the fact that in no single case was a description accompanied by a figure, makes the identification of Hulst's species a matter of considerable difficulty.

But even Hulst left many forms undescribed. Species of *Eupithecia* will, I believe, be found to be quite as numerous in North America as in Europe. I have already over 100 species in my own cabinet, and I shall not be surprised if in the near future our list attains a total of 150 names.

Coming from the district covered in the present paper I recognize about 40 apparently distinct species. I have endeavoured to separate first the species described by Guenée, Grote, Packard and Hulst, and have ventured then to characterize the rest as new to science. I have tried to make my descriptions as full as possible, and have taken into consideration the under as well as the upper sides. Hulst usually omitted reference to the under sides, but I find that the arrangement of the lines on the fore and hind wings beneath often furnishes reliable and easily-recognized specific characters.

I have to confess that I have not yet attempted to break up the genus into sections. I have, indeed, neglected so far the study of generic characters, believing it to be of greater importance first to fix with certainty the specific status of the forms already described and to supply the undescribed ones with names.

The generic nomenclature of our *Geometridæ* is in great confusion, and in danger of being made still worse if hasty revision is attempted. I believe that some of the characters (sexual ones) relied on by Dr. Hulst

for the separation of genera will be discarded altogether by future systematists, but I am far from competent myself to undertake or even suggest reforms in that direction.

As to the name adopted for this genus, I use *Eupithecia* because I agree with those who claim that Curtis's name antedates that of Hubner. There are some, I know, who hold the contrary opinion, and they will continue to call the genus *Tephroclystia*, but it is to be hoped that the error, into which nearly all our modern American writers have fallen, of writing *Tephroclystis* will not be perpetuated. I am not sufficiently acquainted with European literature to know who first made the mistake, but certainly Meyrick in his "Hand-book" uses the wrong spelling, and I think that probably Hulst and others have erred by following him.

With the species already described I shall deal in date order.

The names proposed prior to 1896, the date of Hulst's "Classification," are 18 in number.

In order of publication they are:

1759, absynthiata, Clerck.
1847, scriptaria, Herrich Schaeffer.
1857, coagulata, Guenée.
1860, gelidata, Möschler.
1861, hyperboreata, Staudinger.
1862, anticaria, Walker.
1862, implicata, Walker.
1862, explanata, Walker.
1863, miserulata, Grote.
1867, luteata, Packard.
1873, geminata, Packard.
1873, palpata, Packard.
1873, interruptofasciata, Packard.
1873, strattonata, Packard.
1874, cretaceata, Packard.
1876, albicapitata, Packard.
1876, zygadeniata, Packard.
1876, ravocostaliata, Packard.

Eup. absynthiata, Clerck, Icones, VI, 9, 1759.—This species is dealt with here, not because it occurs in North America, but because the *name* has appeard on all our lists from the time of Packard to the present day.

We have, it is true, several close allies to this species, which will be mentioned later, but the true *absynthiata* has not yet, I believe, been found in America. We have no form nearly so *red* as the genuine *absynthiata* is, and, moreover, in all our forms, so far as I known them, the fringes are *checkered*, while in the European moth the fringe is plain.

Careful breeding of our forms and investigations as to their food-plants will be necessary to make certain their specific distinctness and limits. The larva of the supposed *absynthiata* has been found and

described in North America (See Goodell in CANADIAN ENTOMOLOGIST, Vol. IX, p. 62, food-plant; Cockscomb), but it is not possible now to say to which of our species this description will refer. The larva of the real *absynthiata* of Europe feeds on the flowers of species of *Senecio*, *Eupatorium*, *Artemisia*, *Achillea* and *Solidago*. It is described by Packard (Monograph, p. 50), who quotes verbatim from Newman (British Moths, p. 136), but Newman is there quoting from Crewe (Entomologists' Annual, 1861, p. 140) and has made some curious verbal alterations. The name *absynthiata* must, I think, be struck off our lists.

Eup. scriptaria, Herr. Sch., Schm. Eur., III, 121, 1847.—This is a mountain-loving species, said to have been found in Labrador, and for that reason is given a place on our list.

Three species recently described by me, namely, *E. regina*, *E. modesta* and *E. obumbrata*, are near allies of *scriptaria*, but I think quite distinct. I have a beautiful bred specimen from Switzerland in my cabinet, and should not have any difficulty in recognizing the species should it turn up in any of our northern localities.

Eup. coagulata, Guenée, Spec. Gen., X, 339, 1857.—This species is stated by Packard to be the same as his *E. geminata*, and both are sunk in the Monograph as synonyms of *absynthiata*.

If I am correct in what I have said above as to *absynthiata*, it will follow, I think, that *coagulata* must stand for some American form very near to but distinct from that species. Guenée was familiar, of course, with the true *absynthiata*, and could see the differences existing in the American form, and he has pointed out some of them in his descriptions.

It seems to me most probable that Guenée had before him a specimen of the smaller of the two forms which Packard confused under the name of *geminata*. This is that figured in the Monograph on Plate viii, fig. 2. The only objection to this use of the name seems to be that this form lacks the *reddish* tinge which *coagulata* is said to possess. There is, however, in British Columbia a form which is quite red enough to satisfy the description, and though it is not likely that Guenée's type, said to be from Pennsylvania, could have been a western specimen, it is probable that it was conspecific. I have used the name *coagulata* for the western form, and I now use it also for the eastern, though not absolutely sure that I am correct. It is just possible that still another form may be found in

Pennsylvania which will be better entitled to the name, and in that case the present species will want a new name.

It has been suggested that the European *E. assimilata* and *E. expallidata* might occur here, but I am familiar with these two species, and they are certainly distinct from the one under consideration.

E. coagulata as here determined does not seem to be very abundant, though widely distributed.

My eastern specimens are all dated June. I have one from the Catskill Mountains (June 3, 1899). It is species No. 10 of a series, kindly sent me some time ago by Mr. R. F. Pearsall. I have it also from Montreal, Ottawa and a number of other localities.

Eup. gelidata, Möschler, Wien. Ent. Monats., IV, 47, 1860.—This species is placed on our lists on account of its occurrence in Labrador. According to Staudinger and Rebel (No. 3634), it also occurs in Greenland and the Shetland Islands. I have not seen it.

It is said by the last named authors to be a variety of *E. nanata*, Hubner, a common European (and British) species feeding on *Erica* and *Calluna*. *E. nanata* is a *Eupithecia*, but Hulst places *gelidata* in *Eucymatoge*, relying on the supposed difference in number of accessory cells, or more likely making a mistake through not having had specimens for critical examination.

The original description of *E. gelidata* is copied in the Monograph on pages 64 and 65.

Eup. hyperboreata, Staudinger, Stett. Ent. Zeit., 400, 1861.—Another northern species that I have never seen. Apparently it is nearly allied to the last named. The localities given in Staudinger and Rebel's Catalogue (No. 3635) are Norway, North Germany, Russia and Greenland.

Eup. anticaria, Walker, Cat. Lep. Het., Br. Mus., XXIV, 1241, 1862.—If it should turn out that the number of the accessory cells is a constant character in this genus, then *anticaria* will have to be placed in *Eucymatoge*, for it certainly possesses the two cells. Walker described this species and *implicata* and *explanata* all from Nova Scotia specimens, from the collection of Lieutenant Redman.

It seems to me probable that the three constitute but one species. The description of *anticaria* comes first in Walker's work, and it certainly applies to the common form which goes under that name in our collections, and which occurs almost everywhere, from the Atlantic to the Pacific.

Various attempts have been made by Hulst and others to identify *implicata* as something different to *anticaria*, but so far I have failed to find any form to fit the description better than does the ordinary *anticaria*.

Eup. miserulata, Grote, Proc. Ent. Soc. Phila., II, 32, 1863.—The type of this species is apparently lost. Packard, who had seen the type, placed his *interruptofasciata* as a synonym, but expresses some doubts as to the correctness of this course (see Monograph, p. 54), and I think that anyone reading the two descriptions carefully will agree that they refer to different insects. I believe I have correctly identified Grote's species. In the Packard collection, so Mr. Swett informs me, there is a specimen from the State of Virginia, whence the type came, which agrees exactly with specimens that I had named *miserulata* after a careful study of the descriptions. There are, however, in the Hulst and some other collections specimens of a different species which were sent out by Grote himself as *miserulata*. But it must be noted that Grote said that the only eastern *Eupithecia* known to him was this species. This being the case, it is clear that he could hardly be depended upon to accurately determine specimens in this genus, and I don't think that we should attach much weight to specimens sent out by him—some of them many years after the original specimen had been described, and which do not agree with the description.

Several different species are usually confused together under this name in collections, but the real thing is a rare insect and seldom found correctly identified.

The larva has been described more than once, but it is very doubtful whether any of the descriptions really apply to true *miserulata*. It will be better to ignore them all.

My specimens of this species are from Mr. R. F. Pearsall (No. 2), Bronx, April, 1904, and from Mr. H. D. Merrick, New Brighton, Pa., also taken in April. It seems to be rare.

The species may be easily recognized by the *linear* black discal and the very straight hind margins to the fore wings. (See note in CAN. ENT., XXXVII, 262.)

Von Gumppenberg described a variety *Californiata*, but it is in the highest degree unlikely that any variety of *miserulata* should occur in California.

(To be continued.)

NOTES ON CHRYSOPHANUS HYPOPHLÆAS AND ITS ALLIES, WITH DESCRIPTION OF A NEW SPECIES.

BY F. H. WOLLEY DOD, MILLARVILLE, ALBERTA.

Chrysophanus arethusa, n. sp.—Antennæ black and white-ringed, clubs black above, white, black-tipped beneath. Palpi brown above, whitish at sides and beneath. Eyes ringed with white. Head and thorax dark brown. Abdomen dark brown above, whitish or cinereous beneath.

♂.—Primaries sharply acute at the apices, the outer margin almost straight. Dark smoky-brown, with a handsome bronze lustre, overlaying and sometimes almost completely obscuring a shining fulvous ground, which is most evident in the cell and outer central portion of the wing. In only one out of five specimens is there a well-defined brown outer marginal border. A large rectangular black discal spot on the cross vein at end of cell, a smaller one in the centre of cell, and sometimes a third, smaller and ill-defined, near the base. A transverse row of six interspaceal black spots beyond the cell, varying much in size and distinctness; the upper three, the next two, and the sixth (geminate) in sets obliquely towards anal angle. Secondaries dull fuscous-brown, with a broad fulvous marginal band from anal angle to about two-thirds of the way to apex. A narrow black discal spot, and sometimes a black point in cell. An indistinct transverse row of small black spots just beyond the cell, another of larger spots on the inner edge of the fulvous band, and between these rows is sometimes a series of from two to five irregular metallic blue points. A marginal row of five black spots within the band. Fringes pale fuscous. Beneath, primaries pale yellowish-fulvous, apices and inner and outer margins cinereous. The spots of the upper side reproduced, but more clearly defined, and most of them pale-ringed, and a small sub-basal one in cell present in all the specimens. A transverse submarginal row of irregular blackish blotches in lower half of wing. Secondaries cinereous, with sometimes a faint line or discal mark, and sub-basal, intermedial and postmedial transverse rows of minute brown or blackish points, rarely all distinct, and in most specimens partially obsolete. Sometimes some small paler dashes exterior to the outer row. A very faint orange-red, crenate submarginal line, narrow, sometimes edged anteriorly with ochreous. Fringes almost concolorous.

♀.—Primaries with apices less acute, and outer margin more convex

than in the ♂, with much less of the brown suffusion, but a well-defined brown outer marginal band, and costal area somewhat broadly brown.

Expanse: ♂ 30–35 mm.; ♀ 29–33 mm.

Described from five males and eight females. One male from the foothills, "Lineham's lower log camp, south fork of Sheep Creek," about thirty-five miles south-west of Calgary. All the rest from near the spruce woods about ten or fifteen miles nearer Calgary, July 5th–20th, all but three of the males quite fresh, though one broken in the mail. Types, ♂ and ♀ in U. S. National Museum, the rest co-types. Of these a pair are in the collection of the Entomological Society of Ontario, another pair in that of Dr. Henry Skinner, and the rest in that of the author. Dr. Fletcher and Dr. Holland each have a few specimens. I know of no others.

This may be looked upon as the Rocky Mountain representative of *hypophlæas*, from which it shows some striking differences, particularly in the male sex. It is larger, has more acute apices, and straighter outer margin. The shining bronze of the dark smoky suffusion, which generally obliterates the marginal band, renders some of the males far more handsome than any of the long series of its allies that I have from this continent, Europe or Asia. Beneath it differs in the strong tendency towards obsolescence of the spots and orange submarginal line on secondaries. In the absence of any widely-accepted definition of what a "species" really is, from its well-marked form and apparently isolated position on the entomologically-explored portion of North America, it is at least as deserving of a specific name as a large number of well-known forms on our lists. It has, however, some much nearer allies in some of the so-called forms of *phlæas* that I have from the Himalayas and from Syria under the names of *eleus* and *stygianus*, which, according to the Staudinger Catalogue, refer to the same form, and occur throughout the south palearctic region. And were I treating of the butterflies of the world, in which a tendency to lump would be scarcely avoidable, I should have left the Calgary form undescribed, and probably followed European authors in treating our common eastern species as a varietal form of *phlæas*.

Hypophlæas was described by Boisduval in a French journal from North American specimens by comparison with *phlæas*. A translation is: "Very near *phlæas*, but smaller, with the spots more distinct, the wings more rounded. The under side of secondaries of an ashy whiteness, with the fulvous marginal band well marked. North of California. It is found

in all the Northern United States." I have been unable to procure specimens from further west than Ontario or Illinois. In the Staudinger Catalogue, Lapland, Northern Scandinavia, Sajan-Geibet (Siberia), Amur and North America are quoted as localities for "var. *hypophlæas*," and some that I have bearing labels of some of those Old World localities would pass anywhere as North American specimens, amongst which there is also an occasional tendency to lose the spots, and so assimilate the typical European form. Besides having more pointed wings, the majority of my European and Asiatic specimens show a more decided tendency to develop tails in the secondaries than either the old or new forms of our continent; and it is a fact well worthy of observation that in some, though not all, of those most closely resembling ours in other respects, this tendency is least. *Hypophlæas* is recorded by Capt. Gamble Geddes as occurring in the region of the Crow's Nest Pass, in Southern Alberta. Dr. Fletcher tells me that if any such specimens were preserved they should be in the Geddes collection at Ottawa, but that he is unable to find any. With one or two small females only to hand, if the spots were unusually well developed, *arethusa* might have been passed as *hypophlæas* even by one well acquainted with that species without comment. The name I have chosen is purely fanciful.

GEOMETRID NOTES—No. 2.

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

In 1873 Dr. Packard described a species (5th Rep. Peabody Acad. Sci., 1878) under the name of *Cleora pellucidaria*, having before him two males, one from Maine (Pack.) and the other Albany (Lintner). If my memory serves me correctly, I saw the Maine specimen when at Cambridge in going over his collection. Shortly afterward, through the kindness of Mr. D. H. Haight, I received a female of the same species, taken near his home at Copper Cliff, Ont., Sept. 9, '04, and, in a recent visit to Albany, N. Y., found in the Lintner coll. the original co-type described by Dr. Packard, bearing a label in his handwriting. In the Monograph, page 453, he refers to this species, having a doubt at that time of its validity. The species is a good one, and differs from *semiclusaria*, Walk., by its larger size, stouter build, its uniform soft gray colour, and by having the front a darker smoky hue, while in *semiclusaria*

the front is white or pale yellow, as also are the patagia at their bases. It belongs to the genus Nepytia, Hlst, and seems to be rare. Dr. Strecker (Lep. Rhop. Het. Suppl., 2, 1899) has described as *Cleora fumosaria* a species which I take to be the same, although I have not seen his type, but Dr. Packard's name has priority.

That Dr. Packard had not always a correct eye for species, Mr. Taylor has recently pointed out (CAN. ENT., Vol. 38, p. 403) where he separates from *Cleora umbrosaria*, Pack., a species generically distinct under the name of *Enypia Packardata*, Taylor, and quite correctly, calling attention to the error in the plate (Mono. Plate xi, fig. 33) as to the pectinate antennæ. I will go yet further. Referring to my notes and drawings taken when at Cambridge, I find that three specimens were placed under *Cleora umbrosaria*, the first one, a ♂, was without antennæ, but my note reads: "the stubs surely indicate simple antennæ"; this is *Packardata*, Taylor. The next one was a ♂, *pellucidaria* or large *semiclusaria*, in bad condition, without body or legs, and only *one* pectinate antenna, also without label of any kind; the third clearly a ♀ of *Enypia venata*, Grote. It seems clear to me that, supposing them all to be the same, the plate of the first one was supplied with antennæ to correspond with those of the second, hence the error.

After my trip to Albany, I discovered it to have been Dr. Packard's custom to return his types when described to their original owners, and since *Cleora umbrosaria* was described originally from a single ♂ taken in California by Hy. Edwards, I visited the Am. Mus. of Nat. History, N. Y., into whose possession his collection passed, in the hope of finding it. There I discovered a single ♂ specimen bearing an old No. 183, and labeled "California," and a new one, "No. 12963, Coll. of Hy. Edwards."

It answers in every particular to the excellent description of Dr. Packard, and there is not the slightest doubt in my mind that it is the type, but it proves to be a rather dark, well-covered ♂ of the species afterwards described by Packard (Mono., page 454) as *Cleora nigrovenaria*, having the extra-discal line heavier and the black dashes on the veins less numerous, though they are present. Of course it has the "heavily pectinate antennæ" he especially notes.

The female (Mono. Plate xi., fig. 35), to which he refers on page 453 as unknown to him, is an excellent figure of *Spodolepis substriataria*, described some years later by Dr. Hulst.

A NEW TREE CRICKET FROM STATEN ISLAND AND NEW JERSEY.

BY WILLIAM T. DAVIS, NEW BRIGHTON, STATEN ISLAND, N. Y.

In my collection of tree crickets there is a species collected on Staten Island and at Cranford, Manasquan and Farmingdale, in New Jersey, that appears to be undescribed. It resembles *Œcanthus angustipennis*, Fitch, more than any of the other native species, but may be easily distinguished from it by its larger size, the marks on the first and second antennal joints, which taken together resemble an exclamation point, and by the absence of any clouded area on the top of the prothorax. My attention was first drawn to the species by collecting three examples together on Long Neck, Staten Island, and later I found that I had some others. It has not so far been found at Lakehurst, in the pine barrens of New Jersey, where *Œ. angustipennis* is common.

Figure 7 shows the elevated black marks on the under side of the first and second antennal joints of *angustipennis*, while Fig. 8 represents the marks as they occur in the new species, which may be more particularly characterized as follows:

FIG. 7.

FIG. 8.

Œcanthus exclamationis, n. sp. — Pale greenish-white, including the upper surface of the prothorax, with the top of the head occasionally a little darker. Antennæ each with two elevated black marks on the under side; the one on the first joint shaped like the upper part of an ! point. The mark on the second joint is oblong. Average length from the head to the tip of wing-covers 17 mm.; body, 12 mm.; ovipositor, 5 mm.; width of male tegmina, 5 mm.

Dr. Fitch, in 1856, mentions the black marks on the under side of the antennæ of tree crickets, and in his description of *Œ. niveus*, De Geer, he notes six varieties, three of which he names. One of these is the species *Œ. angustipennis*, Fitch, as now considered by authors; his var. "a" seems to be the new species above mentioned; "b" is probably Mr. Beutenmuller's *pini*, or possibly an example of his own *fasciatus*, and "c" is no doubt *Œ. quadripunctatus*, Beut. The other two ("e," *discoloratus*,

and "f," *fucipes*) cannot be placed, but "f" is likely also a dark-coloured example of *fasciatus*.

Another interesting tree cricket is a form kindly given me by Mr. Charles Schæffer, and collected by him at Brownsville, Texas, and in Southern Arizona. It is of the same size as *Œ. latipennis*, Riley, and the head, as in that species, is also coloured pink, but in all but two examples examined there is a single narrow black line on each of the first two antennal joints. These two joints are light-coloured, and are generally pink; the succeeding ten or twelve are black, and the remainder gradually shade off and are of a lighter hue. This insect appears to be *Œ. varicornis*, Walker, an addition to the fauna of the United States, as it was originally described from Mexico. Walker characterizes the insect as having the fore wings very broad and the antennæ "black towards the base, testaceous at the base." He further adds: "The colour of the antennæ and the broader fore wings distinguish this species from *Œ. niveus*."

BOOK NOTICES.

ANATOMICAL TERMINOLOGY.—With vocabularies in Latin and English, and illustrations by L. F. Barker, M.D., Philadelphia: Blakiston's Sons & Co. 8 vo., pp. 102. (Price $1.00.)

Teachers and students alike of anatomy feel that the existing status of scientific nomenclature leaves much to be desired. Terms are dissimilar in construction, and often unnecessarily long, so that it is a matter of extreme difficulty to acquire familiarity with them. Even more of a grievance is the unfortunate multiplicity of terms applied to one and the same part. Each text-book must burden the reader with synonymous names for many parts, or leave its references uncertain to all who know those parts under other names than the ones used.

That this very real hindrance under which science labours is not insurmountable was the conviction with which the German Anatomical Society, an association of international scope and high repute, undertook the enterprise which resulted in the publication in 1895, after six years of labour, of the B. N. A. (Basle Anatomical Nomenclature). This Associa-

tion appointed a commission of notable scientists from several countries to compile from the many thousands of terms in use, as applied to microscopical human anatomy, a list which should include only the term for each part which was decided to be most suitable. This commission set to work on the difficult and exacting task in hand, guided by certain principles to which they were able to adhere with but few digressions. The aims of the undertaking can be best made clear by quoting Prof. Barker's own statement of these principles :

"(1) Each part shall have only one name.

(2) Each term shall be in Latin, and shall be philologically correct.

(3) Each term shall be as short and simple as possible.

(4) The terms shall be merely memory signs, and need lay no claim to description or to speculative interpretation.

(5) Related terms shall as far as possible be similar, e.g., Femur, Arteria femoralis, Vena femoralis, Nervus femoralis.

(6) Adjectives in general shall be arranged as opposites, e.g., dexter and sinister; major and minor; anterior and posterior; superficialis and profundus."

The result of these labours was a systematized and selected list of Latin terms, which can be used in any country, either through a translation or, better even, in the Latin form. It has been adopted as a basis of nomenclature in Europe to a large extent; and in Great Britain and America has been employed in various medical schools and treatises on anatomical subjects with apparently good success. The publication of Prof. Barker's book from the press of P. Blakiston's Sons & Co., in which both Latin and an Anglicized list are presented, should do much to further the general adoption of the B. N. A.

The general introduction of this list into the educational work of American institutions would, it is hoped, greatly facilitate research and progress in anatomy, by removing the unnecessary part of a most unscientific collection of technical terms, as 5,000 accepted names would serve the purpose, for which there are now many times that number in use.—T. D. JARVIS.

TOWER'S EVOLUTION IN LEPTINOTARSA.

BY FRANK E. LUTZ, COLD SPRING HARBOR, N. Y.

One of the most important of the recent studies of evolution, and probably *the* most important of the purely entomological works on this subject, is Wm. D. Tower's "Investigation of Evolution in the Chrysomelid Beetles of the Genus Leptinotarsa."* "In this contribution have been brought together data concerning evolution in the genus *Leptinotarsa*, Stal, as gathered from various sources [during 11 years], and in as far as it applies to the origin of species. In general, the evidence herein presented has been derived from three sources: (1) its *natural history*, including distribution and œcology, variations, habits and instincts; (2) *development:* (3) *experiment.*" It is the large number and thoroughness of the experiments which makes the work so valuable, and such a refreshing change from the numerous discussions of pin-stuck data that encumber but do not greatly elucidate the problems of evolution.

Chapter I is an interesting discussion of the geographical distribution of the genus. By the use of four of the criteria given by Adams (Biol. Bull., 1902), the centre of origin of the genus is found to be Southern Mexico. The other six criteria are rather severely criticised. If space permitted, these might be profitably discussed, as some of the criticisms do not seem to be fully justified. Valuable detailed data concerning the spread of the Colorado potato beetle are collected and given here.

Chapter II is a study of variation. A number of laws for the genus are deduced. Variation is found to be determinate. "In the elements of the colour pattern there is a tendency for the spots to spread out or contract peripherally, and the stripes and bands to extend or contract at their ends. The spots, stripes and bands are most variable in the posterior or distal portions of the structures on which they occur, and least variable in the anterior and proximal portions thereof. Increase of pigmentation or modification of colour pattern moves caudalward or distalward, while decrease moves cephalward or medianward." "Large or extreme variations are determinate, and always occur in directions corresponding to the maximum lines of fluctuating variations." "All variations of colour and structural characters are strongly correlated, ... so that causes which produce a variation in one part bring about either directly or indirectly corresponding variations in other parts."

*Carnegie Institution of Washington, Publication No. 48, Papers of the Station for Experimental Evolution No. 4.

A number of "extreme variates" are noted, which the author declines to call mutants, but in later discussions refers to as "mutants." It seems to me the quotation marks might well have been left off. The author maintains "that 'mutation' is not a special kind of variability different from that of 'ordinary fluctuating variation,' but it is a part of the normal variability, and the direct response of the germ plasm to stimuli." If I understand the case correctly, these "extreme variates" are quite extreme; they are rare, occurring only once in 6,000 cases; and *breed true*, a thing which ordinary variates do not do. This is my idea of a mutant. The mere question of terms, however, is relatively unimportant. The fact is, Tower has given us one of the strongest arguments for the importance of mutations that has ever been presented, although he seems to think otherwise. He says: "The breeding 'mutants' in our gardens and laboratories can not tell us how they would succeed in nature; my experience with these beetles is that they fare badly, and, as far as I can discover, that they play a minor role in the evolution of species." However, he had already stated (p. 273 *et seq.*) that not only did *pallida*, one of the "mutants," breed absolutely true for six generations in the laboratory with "no tendency to revert to the parental species" *(decemlineata)*, but that from 14 males and 15 females allowed to shift for themselves in nature, 1,580 *pallida* offspring of the 6th generation were found, and he "felt that further experiment with this form unconfined in nature was neither safe nor desirable, and exterminated the entire lot." It is true that 29 *pallida* is more than he ever found in nature at one time and place, but he did find 6 at Clifton, Ohio, and he noted that occasionally, as at Cabin John Bridge, Md., in 1900, sports are relatively very abundant. *Pallida* is only one of a number of similar cases that Tower found. If I had been so fortunate as to obtain his results I would have drawn quite the opposite conclusions, and would have supported the mutation theory most loyally, believing it to be the statement of one, at least, method of evolution.

But the cream of Tower's paper has not yet been noted. After discussing (Chap. III) the ontogeny, chemistry, etc., of coloration in Leptinotarsa, and showing that marked colour variations can be brought about by varying the environmental conditions during development, but that *these variations are not inherited;* and after treating of habits, assortative mating, etc., in Chapter IV, he shows in Chapter V how *inheritable variations can be brought about artificially.* Selection alone is apparently

impotent to create new races until an individual, no different externally from the others, is found whose offspring do not revert as do offspring in general. However, if, after a female, for instance, has attained her final form and coloration, she be subjected to extreme temperature and moisture conditions, the germ plasm of the eggs then maturing is so affected that the beetles developing from them are, for the most part, entirely different from the parent form, even though their entire ontogeny is passed under perfectly normal conditions, and they will breed true, under normal conditions, to their new characters. If this same original female had been returned to a normal environment the eggs which mature under these conditions develop into normal offspring as though their mother had never been forced to give birth to abnormal children. To quote part of a single experiment :

"In May, 1901, I subjected four males and four females from the hibernating population of *decemlineata* to extremely hot (average 35° C.), dry (relative humidity, average 45 per cent.) conditions, accompanied by low atmospheric pressure (19–21 inches) during the growth and fertilization of the first three lots of eggs, which were placed as soon as laid in natural conditions and reared. The last two lots were laid and reared in normal conditions. The first I designated Lot A, the second Lot B. All were reared during their ontogeny from the earliest embryonic stage to adults in normal environment. From 506 larvæ which hatched from Lot A I obtained 96 adult beetles, of which 82 were of the form *pallida*, two of the form *immaculo-thorax*, and 14 unmodified. From Lot B, of 319 eggs I got 61 normal beetles."

In another experiment the action of abnormal conditions on the forming germ plasm brought about inheritable physiological modifications. They had five instead of two or three generations a year, being normal in every other respect. This was kept up through three cycles, when the experiment was stopped. "In the rise of a *five-brooded race* there was a pure, perfectly constant inheritable character arising as the response to stimuli applied to the germ plasm. Eleven years of study of this and related genera have shown that *in none of the family, or relations of the family, are there traces of five-brooded races or species.*"

Unfortunately, further details of the data can not be given here. But an idea of the contents of the paper has perhaps been given. Not even all the conclusions can be quoted. The following, however, can not be passed over : "Variation is to be interpreted upon the basis of response to stimuli directed by the stage of development reached and the nature of the pre-existing stages. Variation is also epigenetic, and not a predetermined character in organisms" (p. 307). "There is not at present

evidence to show the origin of any heritable variations in the soma. Moreover, I have shown that in these beetles we can get new permanent variations by stimulating the germ cells, and in no other way" (p. 311). "I am . . . . of the opinion that the evolution of the genus Leptinotarsa, and of animals in general, has been continuous and direct, developing new species in migrating races by direct response to the conditions of existence. In this evolution natural selection has acted to determine antecedent states and the persistence of new variations, but in each race or species it acts as the conservator of the race, keeping down extreme variations through their elimination in hibernation, larval life and selective mating."

UNITED STATES GOVERNMENT APPROPRIATIONS FOR ENTOMOLOGICAL PURPOSES FOR THE FISCAL YEAR ENDING JUNE 30, 1908.

Bureau of Entomology, Washington	$136,010 00
Emergency appropriations :	
Cotton-boll Weevil investigations	190,000 00
Prevention of spread of Gypsy and Brown-tail Moths	150,000 00
Eradication Cattle Ticks	150,000 00
	$626,010 00

There is also an appropriation of $250,080 for the National Museum, a portion of which will be applied to the Collections of Insects. The expense of printing bulletins, etc., for the Scientific Bureaus is covered by a further appropriation of $824,450.

In the statement of expenditures at the end of the Report of the Experimental Farms of the Dominion of Canada for the year ending June, 1905 (the last we have access to), there is to be found the following item :

"Entomological and Botanical Division, including salaries of officers in charge . . . . . $4,265 38"

This amount may possibly have been increased to $5,000 for the current year.

Dr. Howard has a staff of more than seventy-five men, and considerably over half a million of dollars at his disposal.

Dr. Fletcher has two assistants and five thousand dollars, with nearly as large a territory to cover, and is expected to include botany as well as entomology in his sphere of work. Is not this a disgrace to the Dominion?

ACKNOWLEDGMENTS.

The Curator begs to acknowledge, with grateful thanks, the gift to the Entomological Society of Ontario of a large collection of Canadian and exotic Coleoptera, which are a welcome and valuable addition to the cabinets. The native specimens will be used to fill up blanks and replace imperfect examples in the collections, and will assist very materially in rendering more complete the Society's representation of the insects of the Dominion. Thanks are due to Mr. Henry S. Saunders, of Toronto, for this generous gift.

He also thankfully acknowledges the receipt of a pair of co-types of *Chrysophanus arethusa*, new species, from Mr. Wolley Dod, of Millarville, Alberta. This form is described on page 169 above.

A NEW GEOMETRID.

BY WM. H. BROADWELL, NEWARK, N. J.

Cleora areataria, n. sp.—Type, 1 ♀. Antennæ filiform. Body and wings whitish-gray. Fore wings with three conspicuous, sinuous lines, discal dot faint. T. a. line beginning one-third outward on costa, rounded outwardly and denticulate, inner edge bordered with dark gray; a white patch at base. Middle of wings light gray, almost white, with a faint line running from lower margin to just below discal dot, then rounding outward to just below discal dot, and back to costa, where it ends in a conspicuous black elongated mark.

T. p. line black and bent outward at middle of wings, then inward to costa; between that and outer edge a white denticulate line of same shape as t. p. line. A marginal row of black dots at ends of veins. Area from t. p. line to outer edge dark gray. Fringe checkered white and gray. Lower wings with a faint trace of the inner line.

Beneath pale whitish-gray. T. p. line showing on both wings. Discal dot large, prominent and with a white centre. Discal dot on lower wings smaller, black and solid.

Legs dark gray. Fore legs darker and banded, white and black.

Length of body, 11 mm.; of fore wings, 15 mm.; expanse, 30 mm.

This species may be known by the broad light-coloured band in middle of wings, and white patch at base, equalling about one-half the area of fore wings. It is almost a replica of *C. atrolinearia*, Hulst, but smaller, and lacking the general brown cast bordering the lines of that species.

Locality, Hemlock Falls, South Orange, N. J., April 22nd.

NOTE.—Photo of *C. areataria* can be had by applying to me.

Mailed May 4th, 1907.