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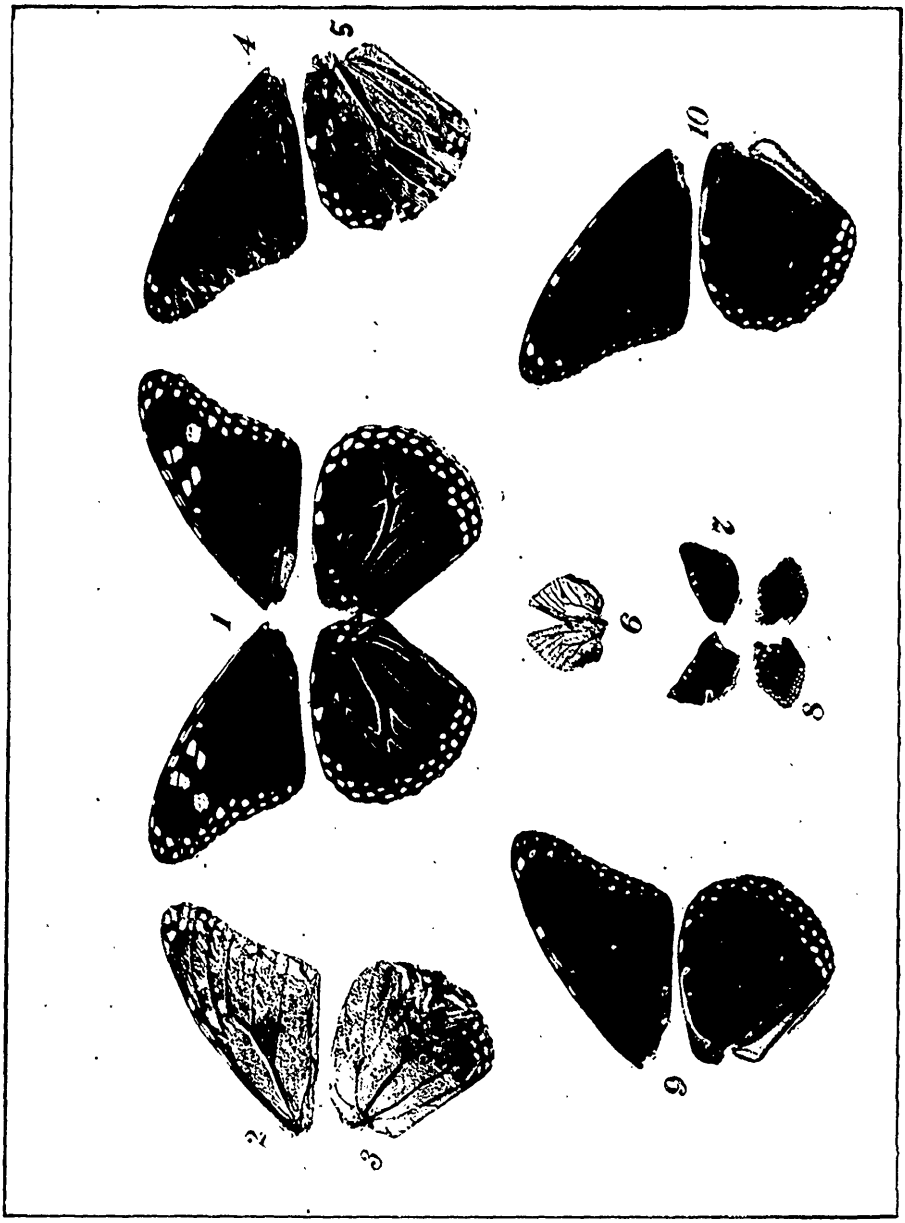

THE WING STRUCTURE OF AN ARCHIPPUS BUTTERFLY.

The Canadian Entomologist.

VOL. XXXI. LONDON, DECEMBER, 1899. No. 12.

BUTTERFLY WING STRUCTURE.

BY J. ALSTON MOFFAT, LONDON, ONT.

Since the season of 1894 (when I first discovered that the upper and lower membranes of a butterfly's wing could be separated), I have had a desire to test the accuracy of the conclusions reached by me at that time; so with the remarkable profusion of *Anosia (Danais) Archippus*, Fab., in the season of 1899, I was able to secure such an abundance of material to work with that I could repeat the observations until every doubt was satisfactorily settled. I shall only give here a brief statement of results reached, as a full account of the various processes will be published in the forthcoming Annual Report of the Society for 1899.

When a wing is fully expanded, and for an hour or two after, the membranes can be easily separated. Entrance for a pin-point between them is to be found at the base of the wing where the subcostal and median nervures come close together. The membranes are united at the costal and inner edges, which have to be cut to get them apart; but they are free at the outer angle. At that time the nervures are in two parts, half in one membrane and half in the other, and open in the centre. The fluid which has been stored up in the pupa enters the winglet at the opening referred to, expanding the membranes as it passes along between them, and the nervures at the same time, and when it has extended to every portion of the wing, then it is fully expanded. The expanding fluid is of a gummy consistency, and as it dries, cements the membranes together, also the edges of the half-nervures, and produces the hollow tubes with which we are so familiar. The photograph for the plate was taken by Mr. R. W. Rennie, of this city, and is an admirable example of amateur photography.

DESCRIPTION OF PLATE 6.

Fig. 1 shows the inner sides of upper and lower membranes of a front and hind wing.

Fig. 2 is the inner side of an under membrane of a front wing.
" 3 is the inner side of an upper membrane of a male hind wing, disclosing the inner side of the black sexual spot.
" 4 is the inner side of an upper membrane of a front wing.
" 5 is the inner side of the lower membrane of a female hind wing.
" 6 shows inner sides of both membranes of a winglet, united at the base. Its exact length is five-eighths of an inch.
" 7 gives a view of a perfect front winglet. The opposite one is incomplete.
" 8 is the under surface of a hind winglet. The opposite one is the upper surface of another. Both imperfect.
" 9–10 are the wings of one butterfly. Length, from base to apex, two inches; width at outer angle, one inch and a quarter.

The membranes at Fig. 1 were separated under water, and the gummy fluid on their inner sides washed off clean. Those at Figs. 2, 3, 4 and 5 were separated without the use of water, the expanding fluid being allowed to dry on, producing the appearance of a thin coat of varnish spread over the whole inner sides of the membranes.

ON THE CLASSIFICATION OF BEES.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

During the last winter, in connection with the study of the local bees, I had occasion to write out my views in regard to their classification, basing my observations upon the recent Apidæ catalogue of Della Torre. As the views then arrived at form a fair statement of my present opinions, I venture to offer them in connection with the recent paper of Mr. Ashmead on the classification of the bees.*

In the arrangement of these insects I attach the most importance to the venation, since it is hardly subject to modifications connected with changes of habit, and shows the least tendency to variation. In the lower bees the first submarginal cell is about as long as the second and third together, and its shortening may be regarded as a specialization. In the more highly specialized venation the marginal cell is truncate or has its apex more remote from the border of the wing. In a similar way a small stigma may be regarded as a characteristic of the more highly

*Trans. Am. Ent. Soc., XXIV, 49-100, 1899.

specialized venation. The most plastic characteristic of the venation is the reduction of the submarginal cells from three to two. This occurs by the obliteration of the first or second transverse cubitals or their coalescence.

I have examples of the following bees in which the first transverse cubitus is wanting: *Sphecodes confertus (falcifer)*, 4 spec., both wings; *S. mandibularis*, 2 spec., both wings; *S. antennariæ*, 2 spec., both wings, 1 spec. one wing; *Augochlora confusa*, 1 spec. one wing; *Andrena claytoniæ*, 1 spec., one wing; *Nomada Cressonii*, 1 spec., both wings; *N. obliterata*, 15 spec., both wings, 6 spec. one wing. Examples of the following species have the second transverse cubitus wanting: *Sphecodes antennariæ*, 1 spec., one wing; *Augochlora confusa*, 1 spec, one wing; *Andrena platyparia*, 1 spec., both wings; *A. solidaginis*, 1 spec., one wing; *A. bipunctata*, 1 spec., one wing; *A. Forbesii*, 1 spec., one wing; *A. claytoniæ*, 3 spec., both wings, 1 spec. one wing; *Nomada Sayi*, 1 spec., one wing. Of the nine specimens of *Sphecodes*, all have the first transverse cubitus wanting, one of these having the second obliterated in the other wing. Of the eight specimens of *Andrena*, all have the second transverse cubitus wanting, one of these having the first obliterated in the other wing. Of twenty-two specimens of *Nomada obliterata*, only one has three submarginal cells in both wings. *Halictus anomalus* and *H. lustrans* (*Hemihalictus lustrans*, Ckll., = *Dufourea lustrans*, Ashm.) I regard as anomalous species of *Halictus* in which the second transverse cubitus is wanting.

As far as I know there is no bee with three submarginal cells in which the first recurrent nervure enters the first submarginal cell, or is interstitial with the first transverse cubitus. When the first submarginal is long, the second quite short, and the first recurrent nervure enters the first, or is interstitial, the first submarginal cell is composite, the next is the third, and the dividing nervure is the second transverse cubitus. I consider that the first transverse cubitus is regularly wanting in *Prosopis*, *Panurginus* and *Neopasites*.

When the submarginal cells are of nearly equal length, and the second receives both recurrent nervures (the first recurrent being rarely interstitial, or nearly so), the first cell is normal, the next is composite, and the dividing nervure is the first transverse cubitus. The second transverse cubitus is regularly wanting in *Parandrena*, *Biareolina*,

Halictoidinæ, *Macropis*, *Panurginæ* except *Panurginus*, *Megachilinæ*, *Eucera*, *Ammobates*, *Pasites*, *Biastes*.

In Perditinæ the long submarginal cell is the first, the next is the third, and the dividing nervure is formed by the coalescence of the first and second transverse cubitals.

These three types of venation are no evidence of affinity, but must have had an independent origin from wings with three submarginal cells.

Characters connected with nectar-sucking, pollen-collecting, and the inquiline habit are, as compared with the venation, more physiological. They no doubt usually indicate relationship, but they often obscure it. I think they may be relied upon when they are confirmed by the venation. On the other hand, when the venation indicates relationship it is hard to disprove it by evidence drawn from the tongue, pollen scopæ, and characters connected with the inquiline habit. If the venation is of a low type, such as that of *Andrena* or *Halictus*, I think the genus should be assigned to a low position in spite of the tongue and scopæ. Usually specializations of venation, tongue and scopæ go hand in hand, but often they do not. A slightly specialized tongue may go with a highly specialized scopa, as in *Macropis*. Or a slightly specialized scopa may go with a highly specialized tongue, as in *Ceratina*. In such cases I assign the bee to a low or high position according to the character which seems to be supported by the venation.

To my mind the most egregious errors in the classification of bees seem to be in the location of the inquilines. The analogy of the case of *Bombus* and *Psithyrus* seems to me of prime importance in the solution of the question. No one doubts that they are more closely related to each other than either is to any host bee or any inquiline. The only differences *Psithyrus* shows are such as are correlated with the inquiline habit. Della Torre's last subfamilies of bees are : 12 Bombinæ ; 13 Psithyrinæ, 14 Apinæ. To give *Psithyrus* this rank, I think, involves a great systematic error only equalled in the old physiological classification of Shuckard. The latter author calls those bees which carry pollen on their legs scopulipedes ; those with abdominal brushes, dasygasters. Under Nudipedes he includes all British bees without scopæ, except *Prosopis*, *Sphecodes*, and *Psithyrus*. But *Coelioxys* and *Stelis* are developed from nudigasters and are related to the Megachilinæ. Della

Torre's subfamily II is Coelioxynæ, including *Coelioxys*, which I regard as a nudigaster, and *Anomobates*, which I regard as a nudipede.

From the analogy of *Bombus* and *Psithyrus*, I claim that *Coelioxys* is related to *Megachile*, *Stelis* to *Anthidium*, *Melecta* to *Anthophora*, *Nomada* to *Andrena*: not only, however, on this analogy, but also on morphological grounds, from the venation and other characters.

Assuming that the inquilines arose from some of their hosts, as is certain in the case of *Bombus* and *Psithyrus*, we would expect the most resemblance between host and inquiline in the recent cases of the highly specialized bees, as *Bombus* and *Psithyrus*, and the least in the oldest cases of the least specialized bees, as *Andrena* and *Nomada*.

In Della Torre's classification, as above stated, *Psithyrus* follows *Bombus*, though in different subfamilies. I would give *Psithyrus* the same position, but put both in the same subfamily. *Stelis* follows *Anthidium* in a separate subfamily, whence I would remove it to follow *Megachile* in Megachilinæ. Also *Melecta* and *Epeolus* follow *Anthophora*, but in a separate family. I would separate *Anthophora* from *Mellissodes*, etc., and put *Melecta* and *Epeolus* with it.

Nomada must seem the most far-fetched of my cases. Although it has a long first discoidal cell, I think other characters of the venation separate it far from *Melecta* and *Epeolus*, especially the large stigma and pointed marginal cell. I think *Nomada* is an ancient offshoot from *Andrena*, and is not related to any other genus. Its differences from *Andrena* and resemblances to other bees I hold are acquired, not inherited. After *Andrena* I would place *Parandrena*, a more recent offshoot, and then write *Nomada*.

In this connection I think the taxonomic proposition will hold that an offshoot from a certain group is related to that group. It may acquire resemblances to the other forms, but not relationship.

That Mr. Ashmead is right in interpolating the inquiline bees among the host bees is no doubt correct, but this has been done by Della Torre to such an extent as to destroy the contrast which exists between Mr. Ashmead's arrangement and the old-fashioned and unnatural arrangement of Schmiedeknecht. As in the Della Torre arrangement, I hold that Mr. Ashmead does not go far enough; indeed, it seems to me that he refutes his own scheme by the very arguments which he cites in defence of it. In his section III. Schmiedeknecht arranges certain bees whose differences

from other bees and resemblances among themselves are associated with the inquiline habit, ignoring the characters which indicate their true relationship. Mr. Ashmead's arrangement of those bees seems to me to illustrate the same kind of taxonomy. If, according to Mr. Ashmead, the inquilines can not form a natural group of Apidæ parasiticæ on account of their varied relationships to other bees, how can *Coelioxys*, which he admits is derived from *Megachile*, and *Stelis*, which he admits is derived from *Anthidium*, form a natural family of *Stelidæ*? In the same line is the reference of all of the inquilines to separate families. Even *Psithyrus* is referred to a special family and separated from the Bombidæ by the interpolation of another family.

Mr. Ashmead's remarks regarding *Macropis* and the Panurgidæ have no significance, in view of the fact that he admits that Panurgidæ is not a natural group; but how can recent offshoots from *Andrena* and *Halictus* and offshoots from Anthophidæ form a natural family? What is to keep a recent offshoot from *Andrena* from being related to *Andrena*? The two submarginal cells can, as I have observed above, be shown to be of three types, all of which must have had an independent origin from bees with three submarginal cells.

The resemblance between the tongues of *Colletes* and *Prosopis* seems to me to be uninherited and misleading. I would follow Schmiedeknecht in arranging *Colletes*.

The arrangement of the inquiline bees with the host-bees will make it a little more difficult to define the groups, and will give some trouble to amateurs who lack an elementary knowledge of morphology. But it will bring us down to the consideration of the characters which are the most important clues to relationship.

I shall now offer what seems to me the most natural arrangement of the local bees:

(1) *Andreninæ:* Andrena, Parandrena, Nomada, Colletes, Nomia.
(2) *Prosopidinæ:* Prosopis.
(3) *Halictinæ:* Sphecodes, Halictus, Augochlora, Agapostemon.
(4) *Halictoidinæ:* Halictoides.
(5) *Melittinæ:* Macropis.
(6) *Panurginæ:* Pseudopanurgus, Calliopsis.
(7) *Perditinæ:* Perdita.

(8) *Megachilinæ:* Andronicus, Alcidamea, Osmia, Heriades, Megachile, Coelioxys, Anthidium, Stelis.

(9) *Ceratininæ:* Ceratina.

(10) *Melissodinæ:* Synhalonia, Xenoglossa, Melissodes, Entechnia, Emphor.

(11) *Xylocopinæ:* Xylocopa.

(12) *Anthophorinæ:* Anthophora, Clisodon, Habropoda, Bombomelecta, Melecta, Epeolus, Neopasites.

(13) *Bombinæ:* Bombus, Psithyrus.

(14) *Apinæ:* Apis.

It seems to me that Mr. Ashmead's classification is an improvement on that of Della Torre: in placing *Sphecodes* near *Halictus*; in separating *Colletes* from *Prosopis*, as far as he goes; in giving a lower position to Megachilidæ, which the long first submarginal cell clearly supports, and in separating *Ceratina* from *Xylocopa*.

In placing *Colletes* with Andreninæ I mean to emphasize the importance of the venation, facial foveæ and pollen-apparatus against the form of the tongue.

At present I do not accept *Pseudopanurgus* as a synonym of *Panurginus*. I refer to it *Scrapter andrenoides* Sm., *Calliopsis albitarsis* Cr., *asteris*, *labrosus*, *rudbeckiæ*, *parvus*, *compositarum*, *solidaginis*, *rugosus*, and *Panurginus labrosiformis*.

The genera Mr. Ashmead refers to Panurgidæ, I would arrange in the following way, excepting those of which I have not seen examples:—*Andreninæ:* Andrena (= Biareolina, Parandrena); *Halictinæ:* Halictus (incl. Dufourea Ashm., Hemihalictus Ckll.); *Halictoidinæ:* Dufourea, Halictoides, Rhophitoides, Rhophites; *Melittinæ:* Macropis; *Dasypodinæ:* Dasypoda; *Panurginæ:* Panurgus, Panurginus (= Scrapteroides), Pseudopanurgus, Epimethea, Camptopocum, Calliopsis; *Perditinæ:* Perdita, etc.

CORRIGENDA.

Page 8, first line of description of Psilopa petrolei, erase the comma after the word "coloured."

Page 100, lines 15 and 9 from bottom; page 111, line 6 from top; and page 112, lines 4 and 19 from top: for Lasius Americanus, *Gm.*, read *Em.*

Page 112, line 12 from bottom, for "Australia *to* Japan," read "Australia *and* Japan."

Page 335, last line, for "*Anthoica?*" read "*Ornithoica.*"

ERRATUM—Page 332, line 8 from top, for "wings" read "twigs."

NOTES ON PHILANTHUS.

BY S. N. DUNNING, HARTFORD, CONN.

In the CANADIAN ENTOMOLOGIST, 1899, p. 293, ff., Mr. Ashmead has divided, first *Aphilanthops* into *Clypeadon*, Patton, and *Aphilanthops*, Patton, and secondly *Philanthus* into *Epiphilanthus*, *Pseudanthophilus*, *Anthophilus*, and *Philanthus*.

(i.)

Mr. Patton describes *Clypeadon* in *Entomological News*, 1897, p. 13, as separated from *Aphilanthops* by its "dorsal valve subquadrate, ventral valve bilobate." *A. quadrinotatus*, Ash., ♀, presents both these characters; *A. elsiæ*, Dunn, ♀, the latter, the other forms not at all. The other characters given by Mr. Ashmead are not sufficient to make a new genus. I am therefore forced to conclude that *Clypeadon* is not valid.

(ii.)

Under (4), page 294, above cited, Mr. Ashmead divides *Philanthus* into *Philanthus* (6) and three new genera (5). While the difference in the eye-emargination exists, it is not true of the division here made. Neither does the division on the venation of the hind wing hold. The one character left is in the punctuation of the abdomen. This is an insufficient foundation for new genera.

(iii.)

A consideration of the characters given under (5), page 294, and based on *Phil. solivagus* ♂ ♀, *P. ventilabris* ♂ ♀, and *P. politus* ♀, gives me the following result:

(i.) There is no difference whatsoever, in so far as I can detect, between the relative lengths of median and submedian cells on the externo-medial nervure.

(ii.) The distance on the cubital nervure, between the junction of the 2nd transverso-cubital nervure and the 2nd recurrent nervure, is less in *solivagus* than in *ventilabris* or *politus*, but that does not change the relative lengths of 2nd and 3rd submarginal (or cubital) cells on the 2nd transverso-cubital nervure (which I take "radius" to mean).

(iii.) While the abdominal segments (excepting the 1st) are less constricted in *solivagus* than in *ventilabris* or *politus*, nevertheless the constriction is there.

As regards the *Pseudanthophilus* and *Anthophilus*, I find clypeus margined in both species cited as types, that the junction of 1st recurrent nervure varies in both species anywhere from the middle to the quarter of the second submarginal cell, and that the one character separating them lies in the last joint of the ♂ antennæ. These cannot, therefore, be considered valid genera.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

BY WILLIAM H. ASHMEAD, ASSISTANT CURATOR, DIVISION OF INSECTS, U. S. NATIONAL MUSEUM.

(Paper No. 7.—Conclusion.)

FAMILY XXIV.—Stizidæ.

This family has been associated usually, as a tribe, with the family *Bembicidæ*, with which, however, according to my views, it has no relationship whatever. It is in reality much closer allied to the *Nyssonidæ*, next to which I have placed it, and from which some of the species are separated with difficulty.

The characters made use of in my table of families will, however, I think, readily separate these three families, and it is unnecessary to repeat them here.

Gorytes monedulоides, Packard, belongs to this family and not to the *Nyssonidæ*, and, as well as I can make out from the description, represents Costa's genus *Ammatomus*. Its entire habitus—the large eyes, the free, almost semicircular labrum, etc.—is that of a Stizid and not of a Nyssonid, and I feel satisfied it belongs here, although, not having seen an authentic specimen of *Ammatomus*, Costa, I may be wrong in assigning it to that genus.

Exeirus, Shuckard, and *Kohlia*, Handlirsch, are included in this family from the descriptions and figures alone, since both are unknown to me in nature.

The genera *Stizoides*, Guerin, and *Megastizus*, Patton, were suppressed by Handlirsch and Kohl, and included with *Stizus*, Latreille. Fox has followed them in this, but, according to my views, all these are good and distinct genera, and I have here restored *Stizoides* and *Megastizus* to their original standing.

It is believed that the following table will enable the student to recognize all of these genera without any difficulty:

Table of Genera.

Marginal cell much shorter than the first cubital cell, rounded at apex; pygidial area in ♀ wanting or incompletely defined; abdomen in ♂ ending in 3 spines..... .....4.

Marginal cell as long or much longer than the first cubital cell.

Second cubital cell *not* petiolate, receiving both recurrent nervures. 2.
Second cubital cell petiolate, oblong, in outline almost elliptical, and receiving both recurrent nervures; cubitus in hind wings originating a little beyond the transverse median nervure or almost interstitial.....Exeirus, Shuckard.

2. Marginal cell lanceolate, *without* an appendage; submedian cell longer than the median.....3.
Marginal cell at apex slightly rounded, *with* an appendage; submedian cell a little shorter than the median.
First transverse cubitus broken by a stump of a vein a little before the middle; hind wings with the cubitus originating much before the transverse median nervure. Kohlia, Handlirsch.

3. Marginal cell almost twice as long as the first cubital cell, or at least one and a half times as long; pygidial area in ♀ distinct, triangular; anterior tarsal joints 2–4 short, transverse.
Cubitus in hind wings originating from about the apical third of the submedian cell; second cubital cell, along the cubitus, fully four times or more longer than along the radius; antennæ longer than the head and thorax united, subclavate; abdomen in ♂ ending in a single spine. Species large..Sphecius, Dahlbom.
Cubitus in hind wings originating from the apical sixth of the submedian cell; second cubital cell, along the cubitus, scarcely three times as long as along the radius; antennae shorter than the head and thorax united, strongly clavate; abdomen in ♂ ending in two short teeth.....Ammatomus, Costa.
Marginal cell not much longer than the first cubital cell; cubitus in hind wings originating a little before the transverse median nervure, or almost interstitial; abdomen in ♂ unarmed (♀ unknown).....Handlirschia, Kohl.

4. Cubitus in hind wings originating far *before* the transverse median nervure, or never beyond the apical third of the submedian cell; mandibles simple; intermediate tarsi longer than their tibiæ, the joints 3–4 short, lobed; claws long, the pulvilli moderate.....Stizoides, Guerin.
Cubitus in hind wings originating at about the apical fifth of the submedian cell; mandibles dentate or simple.

Anterior and intermediate tarsi short, not longer than their tibiæ, the joints 2–4 very short, wider than long, and lobed ; the pulvilli very large ; posterior face of metathorax not deeply impressed, the lateral angles not sharp, rounded and without a deep emargination ; last joint of antennæ in ♂ slightly bent, truncate at apex, the antepenultimate and penultimate joints normal.....Megastizus, Patton.

Anterior and intermediate tarsi always distinctly longer than their tibiæ, the joints 2–4 short, but, except sometimes the fourth, not lobed ; posterior face of metathorax deeply impressed, the lateral angles or ridges sharp, and with a deep emargination ; second cubital cell triangular, always narrowed to a point or nearly above, and often petiolate ; last two joints of antennæ in ♂ curved, the last pointed or ending in a slight spine, the antepenultimate joint *beneath at apex*, ending in a small spine.....Stizus, Latreille.

= Bembecinus, Costa.

= Stizomorpha, Costa.

North American Species.

(1) EXEIRUS, Shuckard.

(2) KOHLIA, Handlirsch.

(3) SPHECIUS, Dahlbom.

(1) S. speciosus, Drury, ♀ ♂.

(2) S. corvallis, Patt., ♀ ♂.

(3) S. Hogardii, Latr., ♀ ♂.

(4) S. grandis, Say, ♀ ♂.

(5) S. fervidus, Cr., ♀ ♂.

(6) S. nevadensis, Cr., ♀.

(7) S. raptor, Handl.

(4) AMMATOMUS, Costa.

(1) A. moneduloides, Pack. (Gorytes) ♀ ♂.

(5) HANDLIRSCHIA, Kohl.

(6) STIZOIDES, Guerin.

(1) S. unicincta, Say, ♀ ♂.

(7) MEGASTIZUS, Patton.

(1) M. brevipennis, Walsh, ♀ ♂

(2) M. texanus, Cr., ♀ ♂.

(8) STIZUS, Latreille.

(1) S. Godmani, Cam.

(2) S. nanus, Handl.

(3) S. flavus, Cam.
var. subalpinus, Ckll.

(4) S. Servillei, Lepel.

(5) S. xanthochrous, Handl.

(6) S. moneduloides, Cr., ♀ ♂.

(7) S. neglectus, Smith, ♂.

(8) S. lineatus, Cr., ♂.

FAMILY XXV.—Sphegidæ.

This family is readily distinguished from all of the previously

described families in the Sphegoidea, by having the abdomen distinctly petiolated, and the totally different habitus.

In having a petiolate abdomen it agrees with the family *Ampulicidæ*, but otherwise it is quite distinct, and is readily separated from it by the normally shaped mesosternum, which is never produced posteriorly into a forked process, and by the clypeus not being produced posteriorly between the antennæ, the latter being always inserted *above* the base of the clypeus.

The family, as here restricted, may be separated into four natural groups, which I have designated as subfamilies, and which may be recognized by the use of the following table:

Table of Subfamilies.

Second cubital cell receiving both recurrent nervures, or the second recurrent nervure is interstitial *with* the second transverse cubitus, although sometimes the first recurrent is interstitial with the first transverse cubitus, or then received by the first cubital cell; tibiæ either spinous or entirely smooth without spines.....2.

Second cubital cell receiving only one recurrent nervure—the first; second recurrent nervure received by the third cubital cell, or at least beyond the second transverse cubitus; very rarely are both recurrent nervures received by the first cubital cell (Neosphex, Reed, = Pseudosphex, Tischb.).

Antennæ inserted on the middle of the face; claws with 1 to 5 teeth beneath; tibiæ *strongly spinous*, or at least never with weak or feeble spines; tarsal comb in ♀ always present; cubitus in hind wings most frequently interstitial, or nearly, with the transverse median nervure; head transverse.....Subfamily I., Spheginæ.

Antennæ inserted far anterior to the middle of the face; claws simple, *without* teeth, or at most with a single small tooth near the middle; tibiæ *smooth*, not spinous; tarsal comb in ♀ *never* present; cubitus in hind wings interstitial..Subfamily IV., Podiinæ.

2. Claws simple, *without* a tooth beneath; tibiæ more or less spinous; tarsal comb in ♀ present; abdomen most frequently very elongate, the petiole composed of *2 joints*, rarely with only *1 joint*; cubitus in hind wings usually originating *beyond* the transverse median nervure.....Subfamily II., Ammophilinæ.

Claws with a single tooth beneath, although sometimes very minute, more rarely without a tooth, the claws simple; tarsal comb in ♀ wanting; abdomen always with a 1-jointed petiole; cubitus in hind wings interstitial.

Antennæ inserted on the middle of the face; metathorax *with* a large U-shaped area above; mesopleura not longer than the height of the thorax.....Subfamily III., Sceliphroninæ.

Antennæ inserted far anterior to the middle of the face, *on* or just above an imaginary line drawn from base of eyes; metathorax *without* a large U-shaped area above; mesopleura much longer than the height of the thorax.....Subfamily IV., Podiinæ.

SUBFAMILY I.—Spheginæ.

In this group, or subfamily, the second and third cubital cells, in the front wings, each receive a recurrent nervure, or both recurrent nervures are received by the first cubital cell; the antennae are inserted on the middle of the face; the tibiæ are strongly spinous; the anterior tarsi in the ♀ always provided with a tarsal comb; while the claws are never simple, being always armed with from 1 to 5 teeth.

Some of the genera falling in this group are quite closely allied and difficult to separate, but it is believed all can be easily separated with the use of the following table:

Table of Genera.

Front wings with three cubital cells, the second and third each receiving a recurrent nervure.....2.

Front wings with only two cubital cells, the first receiving both recurrent nervures; marginal cell short, rounded at apex; median and submedian cells equal; cubitus in hind wings originating *beyond* the transverse median nervure; claws with 2 blunt teeth beneath.....Neosphex, Reed.
= Pseudosphex, Tischb.

2. Second cubital cell wider (higher) than long.....4.
Second cubital cell as long or longer than wide (high), rhomboidal or rectangular.....3.

3. Head normal, transverse, pronotum shorter than the mesonotum or no longer; claws with 2 teeth beneath.

Clypeus anteriorly truncate, usually with a reflexed rim and without a median emargination (rarely dentate); scutellum and

postscutellum most frequently *with* a median longitudinal furrow or depression, or at least one or the other with such a furrow, rarely simple.....Sphex, Linne.

Clypeus anteriorly *with* a median emargination or incision; scutellum and postscutellum normal, *without* a median longitudinal furrow.....Isodontia, Patton.

4. Claws with only one tooth beneath.....5.
Claws with 2–5 teeth beneath.....6.

5. Species metallic blue or violaceous; marginal cell at apex narrowly rounded; cubitus in hind wings *interstitial* with the transverse median nervure; mandibles not especially long; tibiæ more sparsely and feebly spined; maxillary palpi 6-jointed; labial palpi 4-jointed.....Chlorion, Latreille.

Species, except sometimes the abdomen, not metallic; marginal cell at apex truncate or broadly rounded; cubitus in hind wings originating *beyond* the transverse median nervure; mandibles unusually long; tibiæ in ♀ strongly spined; maxillary palpi 6-jointed; labial palpi 5-jointed.....Pronaeus, Latreille.

6. Last ventral plate in ♀ compressed, almost carinate; claws with 2 teeth.....7.
Last ventral plate in ♀ convex, not compressed; claws with 2–5 teeth beneath.....8.

7. Clypeus medially produced, with a deep sinus on each side.....Palmodes, Kohl.
Clypeus obtrapezoidal, truncate anteriorly, entire; eyes within parallel.....Calosphex, Kohl.

8. Claws with 2 teeth; clypeus convex, anteriorly subemarginate medially, without a reflexed rim; anterior tarsal comb short; transverse median nervure in hind wings short..Harpactopus, Smith.
Claws with 3 to 5 teeth; clypeus subconvex, with a more or less distinct reflexed rim anteriorly; anterior tarsal comb long.

Claws with 3–4 teeth; clypeus anteriorly slightly rounded, and not at all, or only slightly, emarginate; transverse median nervure in hind wings curved or somewhat curved, the cubitus *interstitial*, or nearly, with it.....Parasphex, Smith.

Claws with 4–5 teeth; clypeus anteriorly truncate, with a median emargination; cubitus in hind wings originating *beyond* the

transverse median nervure, the latter being straight; mandibles in ♀ 3-dentate, in ♂ 2-dentate.....Priononyx, Dahlb.

SUBFAMILY II.—Ammophilinæ.

The species falling in this group are much more slender and elongate than those of the other groups, and are at once distinguished by the *simple, unarmed* claws, and by the venation of the wings; the second cubital cell in the front wings always receives both recurrent nervures, while the cubitus in the hind wings originates *beyond* the transverse median nervure. The tarsal comb in the ♀ is always present.

Two other subfamilies—*Sceliphroninæ* and *Podiinæ*—have both recurrent nervures received by the second cubital cell; but in these families the claws are armed with a tooth beneath, the tarsal comb in the ♀ is always wanting, while the cubitus in the hind wings is interstitial with the transverse median vein.

Only four genera fall into this family, distinguished as follows:

Table of Genera.

Front wings with two cubital cells.....2.

Front wings with three cubital cells; submedian cell a little shorter than the median.

Petiole of abdomen not especially long, 1-jointed, the second segment campanulate; clypeus in ♀ with a more or less distinct median emargination.....Psammophila, Dahlb.

Petiole of abdomen very long, 2-jointed, the second segment being elongate and slender, forming with the first a long petiole.

Third cubital cell not petiolate.....Ammophila, Kirby.

Third cubital cell petiolate.....Miscus, Jurine.

2. Petiole long, 2-jointed, as in *Ammophila*; submedian cell as long as the median.....Caloptera, Fabricius.

SUBFAMILY III.—Sceliphroninæ.

In having both recurrent nervures received by the second cubital cell, this subfamily approaches the *Ammophilinæ*, but it is readily separated from it by the claws having, as a rule, a single tooth beneath; by the cubitus in the hind wings being interstitial with the transverse median nervure, and by the ♀ always being without a tarsal comb.

From the *Podiinæ* it is separated by the antennæ being inserted on the middle of the face, by the large U-shaped area on the metathorax or middle segment, and by the much shorter mesopleura.

Only two genera are known, distinguished as follows :

Table of Genera.

Second submarginal cell receiving both recurrent nervures.

Species black and yellow, not metallic ; clypeus flat, at apex *bidentate;* transverse median nervure in front wings *not* interstitial with the basal nervure, but uniting with the median vein a little *before* the origin of the basal nervure ; petiole of abdomen about twice as long as the metathorax..... .....Sceliphron, Klug. =Pelopœus, Latr.

Species metallic blue or violaceous; clypeus anteriorly *3-dentate* ; transverse median nervure in front wings *interstitial* with the basal nervure; petiole of abdomen not or scarcely longer than the metathorax..... .....Chalybion, Dahlb.

SUBFAMILY IV.—Podiinæ.

This subfamily comes nearest to the *Sceliphroninæ*, but is at once separated by the antennæ being inserted on the anterior part of the face, *on* or *just above* an imaginary line drawn from the base of the eyes ; by the much longer mesopleura, and by the absence of a large U-shaped area on the metathorax or middle segment.

Three genera are known, separated as follows :

Table of Genera.

First and second cubital cells each receiving a recurrent nervure, or the *first* recurrent is interstitial with the *first* transverse cubitus.....2.

Second and third cubital cells each receiving a recurrent nervure, or the *second* recurrent is interstitial with the *second* transverse cubitus.....3.

Second cubital cell receiving both recurrent nervures..Podium, Fabricius.

2. Second cubital cell wider than long ; hind femora, in both sexes, normal, the basal joint of their tarsi much shorter than their tibiæ ; petiole long or longer than the metathorax...Podium, Fabr. (pars.)

Second cubital cell longer than wide ; hind femora in ♀ dilated at apex, their tibiæ shortened, the basal joint of their tarsi as long, or nearly, as the tibiæ; petiole shorter than the metathorax. Stethrorectus, Smith.

3. Head in outline as seen from above, triangular, much produced behind, the temples oblique, but broad ; pronotum conically produced, longer than the meso- and meta-notum....Trigonopsis, Perty.

North American Species.

(1) NEOSPHEX, Reed.
= Pseudosphex, Tischb.

(2) SPHEX, Latreille.
(1) S. argentata, Dahlb.
(2) S. aurulentus, Fabr.
(3) S. beatus, Cam., ♂.
(4) S. Belfragei, Cr., ♀.
(5) S. brasiliensis, Sauss., ♀.
? = tinctipennis, Cam.
(6) S. caliginosus, Erich.
(7) S. chichimecus, Sauss., ♂.
(8) S. chrysophorus, Kohl.
(9) S. clavipes, Kohl., ♀.
(10) S. croesus, Lepel.
(11) S. crucis, Fabr.
(12) S. dubitatus, Cr.
(13) S. flavipes, Smith.
(14) S. habena, Say.
(15) S. ichneumonea, Linné. - var. dorsalis, Lepel.
(16) S. lautus, Cr.
(17) S. mandibularis, Cr.
(18) S. Maximiliani, Kohl.
(19) S. mixtus, Fabr.
(20) S. pennsylvanicus, Linné.
(21) S. rufipes, Lepel.
(22) S. singularis, Smith.
(23) S. spiniger, Kohl., ♂.
(24) S. T, Beauv.
(25) S. tepanecus, Sauss.
(26) S. texanus, Cr.
(27) S. vagus, Drury.

(3) ISODONTIA, Patton.
(1) I. azteca, Sauss.
= macrocephalus, Fox.
(2) I. costipennis, Spin.
(3) I. elegans, Smith.
(4) I. instabilis, Smith.
(5) I. lucæ, Sauss.
(6) I. philadelphica, Lepel.
(7) I. robusta, Cam.
(8) I. tibialis, Lepel.

(4) CHLORION, Latreille.
(1) C. aerarium, Patton.
(2) C. coeruleum, Drury.
(3) C. columbianum, Grib.
(4) C. nearticum, Kohl.
= coeruleum, Auct., *pars.*
(5) C. occultum, Kohl.
= coeruleum, Auct., *pars.*

(5) PRONÆUS, Latreille.

(6) PALMODES, Kohl.
(1) P. dimidiata, DeGeer.
=abdominalis, Cr.
(2) P. morio, Kohl.
(3) P. praestans, Kohl.
(4) P. rufiventris, Cr.

(7) CALOSPHEX, Kohl.

(8) HARPACTOPUS, Smith.
H. laeviventris, Cr.

(9) PARASPHEX, Smith.

(10) PRIONONYX, Dahlbom.
(1) P. atratus, Lepel.
(2) P. bifoveolatus, Tischb.
=canadensis, Prov.
=thomæ, Fabr., *pars.*
(3) P. brunneipes, Cr.
(4) P. excisus, Kohl.
(5) P. ferruginosus, Fox.
(6) P. thomæ, Fabr.

Subfamily II—*Ammophilinæ*.

(11) PSAMMOPHILA, Dahlbom.
- (1) P. argentifrons, Cr.
- (2) P. collaris, Cr.
- (3) P. communis, Cr.
- (4) P. grossa, Cr.
- (5) P. luctuosa, Smith.
- (6) P. robusta, Cr.
- (7) P. ? violaceipennis, Lepel.

(12) AMMOPHILA, Kirby.
- (1) A. Alberti, Hald.
- (2) A. alpestris, Cam.
- (3) A. alticola, Cam.
- (4) A. anomala, Taschb, ♀ ♂.
- (5) A. arvensis, Dahlb.
- (6) A. atriceps, Smith.
- (7) A. aureonotata, Cam.
- (8) A. azteca, Cam.
- (9) A. barbata, Smith.
- (10) A. breviceps, Smith.
- (11) A. cementaria, Smith.
- (12) A. centralis, Cam.
- (13) A. ceres, Cam.
- (14) A. Championii, Cam.
- (15) A. chiriquensis, Cam.
- (16) A. comanche, Cam.
- (17) A. conditor, Smith.
- (18) A. consors, Cam.
- (19) A. cora, Cam.
- (20) A. dejecta, Cam.
- (21) A. extremitator, Cr.
- (22) A. femur-rubra, Fox.
- (23) A. ferruginosa, Cr.
- (24) A. Gaumeri, Cam.
- (25) A. gracilis, Lep.
- (26) A. Guerinii, D. T.
- (27) A. jason, Cam.
- (28) A. inepta, Cr.
- (29) A. intercepta, Lepel.
- (30) A. iridipennis, Cam.
- (31) A. juncea, Cr.
- (32) A. macra, Cr.
- (33) A. mexicana, Sauss.
- (34) A. micans, Cam.
- (35) A. montana, Cr.
- (36) A. Montezuma, Cam.
- (37) A. Morrisonii, Cam.
- (38) A. neartica, Kohl.
- (39) A. nigricans, Dahlb.
- (40) A. nigrocoerulea, Cam.
- (41) A. picipes, Cam.
- (42) A. pictipennis, Wahb.
- (43) A. placida, Smith.
- (44) A. polita, Cr.
- (45) A. procera, Dahlb.
- (46) A. pruinosa, Cr.
- (47) A. quadridentata, Cam.
- (48) A. saeva, Smith.
- (49) A. sonorensis, Cam.
- (50) A. strenua, Cr.
- (51) A. striolata, Cam.
- (52) A. trichiosoma, Cam.
- (53) A. urnaria, Dahlb.
- (54) A. valida, Cr.
- (55) A. variipes, Cr.
- (56) A. volcanica, Cam.
- (57) A. vulgaris, Cr.
- (58) A. xanthoptera, Cam.
- (59) A. Yarrowii, Cr.

(13) MISCUS, Jurine.

(14) CALOPTERA, Fabricius.
- (1) C. Wrightii, Cr., ♀ ♂.

Subfamily III—*Sceliphroninæ*.

(15) SCELIPHRON, Klug.
- (1) S. cementarius, Drury.

var. canadensis, Smith.
var. architectus, Lepel.
var. lucæ, Sauss.
var. flavipes, Fabr.
var. flavipunctum, Chrisb.
var. flavimaculatum, DeGeer.
var. jamaicensis, Fabr.
(2) S. Servillei, Lepel.
(3) S. fasciatum, Lep.
= argentifrons, Cr.
(4) S. annulatum, Cr.
(5) S. assimile, Dahlb.
(6) S. argentispilus, Prov.
(7) S. tau, D. T.
(8) S. nigriventris, Costa.
(16) CHALYBION, Latreille.
(1) C. californicum, Sauss.
(2) C. coeruleum, Linné.
(3) C. texanum, Cr.
(4) C. Zimmermanni, Dahlb.
(5) C. aztecum, Sauss.

Subfamily IV—*Podiinæ.*

(17) PODIUM, Fabr.
(1) P. luctuosum, Smith.
(2) P. rufipes, Fabr.
(3) P. bellum, Cam.
(4) P. bugalense, Cam.
(5) P. fulvipes, Cr.
(6) P. opalinum, Smith.
(7) P. petiolatum, Drury.
(18) STETHORECTUS, Smith.
(19) TRIGONOPSIS, Perty.
(1) T. violaceus, D. T.

FAMILY XXVI.—Ampulicidæ.

This family, in general appearance and in having a petiolate abdomen, is allied to the *Sphegidæ*, but is readily separated by the mesosternum being produced into a forked process posteriorly, by the mesonotum having distinct parapsidal furrows, by the clypeus being produced posteriorly between the insertion of the antennæ, often rostrate or carinate, and by its metathoracic characters.

The species, so far as we know, prey upon cockroaches, and thus differ in their habits from the *Sphegidæ*.

The family may be divided into two natural groups, which I have designated as subfamilies, and which may be distinguished by the use of the following table:

Table of Subfamilies.

Marginal cell at apex acute, *without* an appendage; metathorax posteriorly truncate or rounded, unarmed; clypeus not carinate.....Subfamily I., Dolichurinæ.

Marginal cell at apex rounded, *with* an appendage; metathorax posteriorly squarely truncate, the upper angles most frequently acute or toothed; clypeus carinate.....Subfamily II., Ampulicinæ.

SUBFAMILY I.—Dolichurinæ.

This subfamily is easily distinguished from the *Ampulicinæ* by a pointed, not truncate, marginal cell, by the non-carinate clypeus, and by the rounded, or at least unarmed, metathorax.

The group is unknown in our fauna, and is found principally in Australia, or at least in the Oriental region, only a single genus *Dolichurus* being found in Europe.

According to Kohl, *Dolichurus*, like *Ampulex*, preys upon Blattidæ, which they store up in their nests as food for their young.

Three genera fall into this subfamily, and may be recognized by the characters made use of in the following table:

Table of Genera.

Stigma not small, subovate; submedian cell shorter than the median; metanotum with foveolæ.....2.

Stigma small, poorly developed; submedian cell shorter than the median; metanotum with several longitudinal carinæ.

Third cubital cell smaller than the second, narrowed towards the radius; cubitus in hind wings originating a little *before* the transverse median nervure, or interstitial; metanotum above not broadened out laterally.....Dolichurus, Latreille.

Third cubital cell quadrangular, much longer than the second; cubitus in hind wings originating beyond the transverse median nervure; metanotum above broadened out laterally.....Trirogma, Westw.

2. Second cubital cell subtriangular, smaller than the third; cubitus in hind wings interstitial; metathorax rounded posteriorly; clypeus produced medially; claws toothed.....Aphelotoma, Westw.

SUBFAMILY II.—Ampulicinæ.

In this family the marginal cell is more or less rounded at apex, with an appendage; the clypeus is subrostriform and carinate; while the metathorax posteriorly is truncate, with the upper angles most frequently acute, toothed or produced into spines.

Kohl would restrict all the species to a single genus, *Ampulex*, Jurine, treating the others as sections; but in this I cannot follow him, since I believe these sections are really genera, to which names have already been applied.

Four genera have been recognized, and are distinguishable by the aid of the following table:

Table of Genera.

Front wings with three cubital cells; pronotum often with a tubercle at base above.....2.

Front wings with two cubital cells; pronotum never with a tubercle at base above.

Metathorax subquadrate, a little longer than wide, squarely truncate posteriorly, but the superior hind angles not produced into strong teeth, at the most with a small tubercle or tooth, the dorsum with longitudinal carinæ, the interstices transversely striate; claws with a median tooth beneath; maxillary palpi 6-, labial palpi 4-jointed; head *without* a frontal area above antennæ; submedian cell not longer than the median; first flagellar joint longer than 2–3 united; pronotum fully twice as long as wide at base.....Rhinopsis, Westw.

Metathorax quadrate, the superior hind angles more or less produced into blunt tubercles or short teeth, the dorsum sculptured as in *Rhinopsis;* claws cleft; head *with* a frontal area above the antennæ, or at least with strong lateral carinæ extending from base of each antenna backwards towards the ocelli; submedian cell a little longer than the median; first flagellar joint not longer than 2–3 united; pronotum not or only a little longer than wide at base.....Waagenia, Kriechbaumer.

2. Superior hind angles of metathorax produced into strong teeth or long spines; claws cleft.

Face normal, *without* an enclosed frontal area above the antennæ; pronotum always tuberculate; abdomen in ♀ compressed at apex; metathoracic spines very long.....Chlorampulex, Sauss.

Face with a frontal area above the antennæ, which encloses the front ocellus; pronotum more rarely tuberculate; abdomen in ♀ not compressed at apex; metathoracic spines not long.....Ampulex, Jurine.

North American Species.

FAMILY XXVI.—*Ampulicidæ.*

Subfamily I.—*Dolichurinæ.*

(1) DOLICHURUS, Latreille.

(2) TRIROGMA, Westwood.

(3) APHELOTOMA, Westwood.

Subfamily II.—*Ampulicinæ.*

RHINOPSIS, Westwood.

(1) R. canaliculata, Say., ♀ ♂. = Abbottii, Westw.

(2) R. maculicornis, Cam., ♀.

WAAGENIA, Kriechbaumer.

CHLORAMPULEX, Saussure.

AMPULEX, Jurine.

(1) A. angusticollis, Spin., ♀.

A CONTRIBUTION TO THE DISCUSSION OF SPILOSOMA CONGRUA.

BY R. OTTOLENGUI, NEW YORK.

I have found the discussion of the identity of *Spilosoma congrua*, originating with the article by Rev. Dr. Fyles, most interesting, and am tempted to record certain facts not in consonance with the published views of the gentlemen who have already written.

Dr. Fyles appears to argue that *cunea* may be *congrua*. He tells us, speaking of *textor*, that there is one brood in his locality usually spotless and measuring 14 lines, and then states that "southward there is a second brood of *textor* noted for its variations, this being supposed to be the *cunea* of Drury." He then refers to Prof. Riley's figures of *cunea* (Forest Insects, page 245), and declares that with his series of bred specimens of *congrua* he can match all of Prof. Riley's figures in maculation, and especially in size.

In Prof. Smith's reply to Dr. Fyles I find this statement: "Nearly all the northern specimens *(cunea)* run small; the southern specimens, on the other hand, mostly run large."

Early in the spring of this year it will be recalled that a "cold snap" overspread the entire Atlantic coast. This cold was especially exceptional in the Southern States, and the approaching summer was so delayed that vegetation budded but two weeks earlier in South Carolina than in New York City. I spent the latter half of March in Summerville, South Carolina, and when I left the young leaves were just giving the forest a delicate green tint. Two weeks later the parks in this city were in about the same condition. I mention this to indicate the closeness of the seasons south and north this year to make my deductions more pointed. One of the first moths to appear in the vicinity of New York is what we call *cunea*, and they can be commonly expected early in April. This early brood is almost invariably spotless, or practically so. During my stay in Summerville, the nights being very cool, and even the days far from warm, insect life was not very abundantly noticeable. The only moth really common was *cunea*, of which I took about twenty specimens and saw above a hundred others. While I did not capture all that I saw, I particularly examined them, this being easy, as they were sitting at rest along the piazzas and hallways. This examination was made because I noted that these early moths were all profusely spotted, all without exception

being like fig. j of Prof. Riley's series. This astonished me because of my northern experience, and I scrutinized all that I saw, even though I did not bottle them, being on the watch for an immaculate specimen. All pure white moths found, however, proved to be *virginica*, and of these I took but three. Thus it seems improbable that Dr. Fyles's idea is correct, and that a *second* brood in the south is spotted. These insects captured by me in the middle of March, in a backward season, can hardly have come from larvæ hatched the same year. In regard to size, Prof. Smith's idea does not hold, for the largest specimen taken is slightly smaller than my smallest northern specimen.

Next, a word as to the distribution of *congrua*. Prof. Smith contends that *congrua* is not recorded (except Walker's Georgia specimens) from the south. It happens that the set in my collection is peculiar in the light of this statement. I have one male, given to me years ago by Miss Emily Morton, still bearing her label, New Windsor. Then, one male and two females from Nashville, Tennessee, and lastly, two males taken by myself in March at Summerville, So. Ca., so that of my six specimens, five are southern.

A few more words as to size and maculation, and I have done. The study of variable insects is naturally more interesting than where we have to consider species fairly constant in pattern; but there is a point which I desire to make which I have not seen noted by any other authors, though not improbably it has been. I believe that *there is a type of pattern in all species*, and that this type will be constant, regardless of the variability. Thus, in a spotted species certain spots will be constant whether accompanied by others or not. If we have to deal with a species sometimes spotted and sometimes immaculate, then the immaculate form must be the type, and the spotted forms merely variations, though among these spotted variations there may be found a constancy as true as with a normally spotted species. Can we apply this rule to *congrua* and *cunea?* Let us call *congrua* a spotted species and *cunea* an immaculate species, and weigh the result. Dr. Fyles records a long series of *congrua* and describes the variations of the pattern, but he has noted that on his most immaculate form there was a small black dot on the median nerve at the angle of the second fork. This dot he records on all his varieties, and it is therefore the constant character which prevents us from considering that the typal pattern is immaculate. Nevertheless, later he tells us that with his

series he has been able to match all of Prof. Riley's figures of *cunea*, overlooking the fact that the dot at the fork is not a constant feature of Prof. Riley's series, if, indeed, it occurs at all exactly as it does in *congrua*. Examining my own six specimens of *congrua*, which vary considerably otherwise, the dot at the fork is present in all. My New Windsor specimen is immaculate except for the dot. The three from Tennessee all have the dot, but also a faint row of spots near the outer margin. My Summerville specimens are worthy of special mention. I was inclined to think they might represent a new species, until Dr. Dyar expressed a contrary view. It is still possible that they are distinct; I have not yet had time to give full study to the subject. On Dr. Dyar's opinion, however, they may rest for the present as *congrua*. They have the spot at the fork and a row of spots near the border, in this respect matching the Tennessee specimens very well. But the outer half of the costa is black, the tips are blackish, and the upper half of the fringes are also blackish. At a casual glance one would say they had been soiled in an electric-light globe, but there being two specimens similarly marked and having been taken where the only electric lights were enclosed in incandescent globes, the dark parts must be considered as normal. Moreover, Dr. Dyar tells me he has seen one specimen in which all of the primary was smoky.

In regard to *cunea* there is certainly a purely immaculate form, nine such specimens being before me. Dealing with the spotted forms, can we find the typal pattern which is constant? I think so; and it is not a spot at the fork; it is, I think, a spot on the costa, near the base. I have a specimen showing this spot, which is otherwise immaculate, and my series includes seventeen specimens, in every one of which this spot on the costa occurs, in the more maculated forms being the top of a veritable band. The extreme of my series is so suffused that the bands nearly coalesce, giving the primaries an almost uniform colour. Curiously enough, this is one of my Summerville specimens, and is as small as any that I have.

In regard to size, it seems very certain that *congrua* is a much larger species, even though the smallest *congrua* may match the largest *cunea*. My *cunea* range from 30 mm. (♂) to 35 mm. (♀), while my *congrua* range from 35 mm. (♂) to 45 mm. (♀).

There is no doubt in my mind that *congrua* is distinct from the *cunea* forms, but is it possible that the immaculate and the spotted forms of *cunea* may be distinct?

NEW SPECIES OF NORTH AMERICAN MYRMELEONIDÆ.

BY ROLLA P. CURRIE, WASHINGTON, D. C.

V.

In the CANADIAN ENTOMOLOGIST for March, 1899, page 70, Mr. Nathan Banks describes a new species of Brachynemurus under the name *tuberculatus*. The specimen used in drawing up the description was a female, and as I find a male of this species in the National Museum collection, a description of it is given here:

Brachynemurus tuberculatus, Banks.

Male.—Length, 21.5 mm.; expanse of wings, 33 mm.; greatest width of anterior wing, 3.6 mm.; length of antennæ, 4 mm. Much smaller and more slender than the female.

Antennæ longer and less clavate. The form of head and thorax is similar to that of the female and the markings are similar.

Abdomen pale luteous, clothed with white and black hairs; an interrupted longitudinal fuscous line on the dorsum, and a broader, less clearly defined stripe each side; segments of apical third of abdomen almost entirely fuscous.

Appendages similar in form and proportionately as long as those of *B. Sackeni;* black, clothed with long black and white hairs; each appendage armed, interiorly, with about a dozen strong, blunt, black spines.

Wings smaller, more slender, and less heavily marked than in the female.

Type.—No. 4328, U. S. National Museum. Collected in Madera Canyon, Santa Rita Mts., Arizona, June 8, 1898, by Mr. E. A. Schwarz.

Two more specimens of this species, females, were collected at the same locality by Mr. Schwarz on June 8 and 14, respectively.

Brachynemurus papago, new species.

Male.—Length, 40 mm.; expanse of wings, 57.5 mm.; greatest width of anterior wing, 7.5 mm.; length of antenna, 7 mm. Slender; above luteous, marked with fuscous; below, principally fuscous; clothed with black and white hairs, especially on the abdomen.

Face nearly flat, luteous; upper part, between and surrounding the antennæ, piceous, sending a median line and one on each side down to the clypeus. Circumocular area luteous, a few fuscous spots posteriorly. Clypeus luteous, clouded with fuscous. Labrum transverse, luteous;

rounded laterally and anteriorly narrowed, emarginate in front. Mandibles piceous.

Maxillary palpi moderate, piceous, luteous at articulations; first two joints short, about as broad as long, subequal; third joint a little longer than first two together, somewhat curved; fourth slightly shorter than third; apical joint as long as third, subcylindrical (very slightly swollen medially), darker piceous; tip truncate, pale.

Labial palpi a little longer than maxillary; first joint twice as long as broad, piceous; second joint about three times as long as first, curved, swollen apically, luteous, piceous at base; apical joint fusiform, piceous, moderately hirsute; tip fine, truncate, pale.

Maxillary palpigers luteous, with fuscous spots. Labium and mentum luteous, the former with a longitudinal median dark line.

Antennæ somewhat clavate, scarcely as long as thorax, fuscous, with very short, stiff hairs; club paler; articulations luteous; first two joints luteous, clouded with piceous, the base of first joint surrounded by a luteous ring.

Vertex elevated behind, rounded, luteous; depressed portion anteriorly dark fuscous; elevated portion with two transverse, dark fuscous bands, the posterior more irregular and broken; a mesial fuscous spot on posterior margin.

Pronotum with three longitudinal dark fuscous lines each side; the median pair coalesce midway between front and hind margins, diverging posteriorly and anteriorly; the outermost line on each side extends forward not quite to the transverse furrow. Beneath luteous, a longitudinal fuscous streak on each side near carina.

Meso- and metanotum with the lobes moderately elevated; markings similar to those of *B. Hubbardii.* Sides and sterna fuscous, with luteous markings.

Abdomen above luteous for the basal two-thirds, a longitudinal dark fuscous line in the middle. Sides and venter fuscous. Apical segments dark fuscous, a few small, indistinct, luteous spots above. Apical segments thickly hirsute.

Appendages similar to those of *B. peregrinus* or *B. Coquilletti*, but still shorter, blunter, and more divaricate; beset with the usual long coarse hairs or bristles; dark fuscous, pale on inner sides; the inferior triangular projection luteous.

Legs moderate, luteous, dotted and blotched with fuscous, beset with white and black hairs and spines; tibiæ piceous at bases and apices. Tibial spurs as long as first tarsal joint, slightly curved, rufo-piceous. Tarsal joints piceous apically, the third and fourth entirely so; claws slightly more than half the length of last tarsal joint, rufo-piceous.

Wings like those of *B. niger* and *B. brunneus*, though broader, and with markings darker than in the male of the latter species—almost equalling in size and in extent and intensity of the markings those of the females.

Female.—Length, 29 mm.; expanse of wings, 56 mm.; greatest width of anterior wing, 7.5 mm.; length of antenna, 5 mm.

Antennæ more clavate than in male. Abdomen a little shorter than wings, marked as in the male, but the luteous on dorsum extends further posteriorly. Tip of abdomen with long black hairs, principally dark fuscous; inferior part with coarse, blunt, black spines; below, two small cylindrical appendages, fuscous, with long black hairs. Markings of wings rather more pronounced than in the male.

Type.—No. 4369, U. S. National Museum. One male specimens, collected in Madera Canyon, Santa Rita Mts., Arizona, June 7, 1898, by Mr. E. A. Schwarz.

No. 4369a, U. S. National Museum. One female, with same locality and date, collected by Mr. Schwarz.

Named after the Indian tribe living in this section of country.

This species has the wings of *B. niger* or *B. brunneus*, six prothoracic lines as in *B. Sackeni*, and meso- and meta-notal markings similar to those of *B. Hubbardii*. The abdomen and appendages resemble those of *B. peregrinus*.

Brachynemurus pusillus, new species.

Female.—Length, 19 mm.; expanse of wings, 36.4 mm.; greatest width of anterior wing, 4.7 mm.; length of antenna, 4 mm. Slender; head and thorax luteous, marked with fuscous; abdomen principally fuscous.

Face flat, luteous, the portion behind and in front of antennæ piceous, a more or less distinct luteous spot between the antennæ; a dark line extends from the piceous area in front down towards the clypeus. Circumocular area luteous, with some fuscous spots behind. Clypeus

luteous. Labrum luteous, obscurely clouded with fuscous. Mandibles piceous.

Maxillary palpi moderate, luteous; first two joints short, subequal; third about the length of 1 plus 2; fourth somewhat shorter than third; apical joint as long as third, tip narrowed, truncate.

Labial palpi about same length as maxillary; first joint short, twice as long as broad; second joint three times longer, curved, apically enlarged; apical joint as long as second, fusiform, sparsely haired, tip fine, truncate.

Maxillary palpigers luteous, marked with fuscous. Labium and mentum luteous.

Antennæ strongly clavate, scarcely as long as thorax, moderately hirsute, luteous, a fuscous spot on nearly all the joints; club thickly spotted with fuscous above; two basal joints luteous, shining.

Vertex elevated, luteous; two transverse fuscous bands on elevated portion, the posterior band very irregular.

Pronotum longer than broad, strongly narrowed anteriorly, somewhat rounded in front; a broad longitudinal median fuscous band, interrupted at the transverse furrow, but continued beyond it; the band is more or less divided lengthwise by a faint luteous line; the portion behind the furrow is anteriorly exteriorly excised; an irregular, interrupted fuscous line and some small spots each side. Beneath luteous, a fuscous streak each side near carina.

Mesonotum with lobes moderately elevated, with a number of long curved black bristles and some smaller white hairs; anterior lobe fuscous, divided longitudinally by a fine luteous line, a round luteous spot each side; lateral lobes luteous, each with a C-shaped fuscous spot, opening externally, and other irregular spots; between the lateral lobes and going back across the posterior lobe is a fuscous band, extending laterally in front, forming a T-shaped marking. Sides and sterna luteous, spotted with fuscous.

Metathorax marked similarly to the mesothorax.

Abdomen fuscous; dorsum with the articulations and an irregular spot in the middle of each segment luteous. Tip of abdomen with the usual long hairs and short, coarse, black spines; below, two small yellow cylindrical appendages with long black hairs.

Legs moderate, luteous, dotted with piceous on femora; apices of femora and tibiæ piceous; each tibia encircled with another transverse piceous band near base, less pronounced on posterior legs. Tibial spurs as long as first two tarsal joints on anterior and middle legs, shorter on posterior, moderately curved, rufo-piceous; tarsi with third and fourth joints and tip of the apical one piceous; claws slightly more than half the length of last tarsal joint, rufo-piceous.

Wings a little longer than abdomen, hyaline, the posterior margins slightly incurved apically. Outer half of pterostigma luteous, inner half fuscous. Apical third or more of intercostals forked in anterior wings, a less number in the posterior wings. Veins hairy, the costa mostly luteous, the subcosta fuscous, interrupted with luteous between transversals; other veins fuscous, less regularly interrupted with luteous.

Anterior wings with a series of fuscous spots between the subcosta and the vein immediately below it—these spots for the most part cover the transversals; a few rather large spots on anterior side of submedian vein and one at its tip; another spot at the tip of postcosta, near hind margin; smaller forks near apices of wings clouded with fuscous; posterior wings a little shorter and narrower than anterior, unspotted. Posterior borders of both wings fringed with fine hairs.

Male.—Length, 18 mm.; expanse of wings, 33.5 mm.; greatest width of anterior wing, 3.8 mm.; length of antenna, 4 mm. Somewhat smaller than the female; antennæ less clavate; appendages extremely short (not discernible in this specimen except with a lens), blunt, luteous, clouded with fuscous; inferior triangular projection luteous, with long dark hairs.

Type.—No. 4370, U. S. National Museum. One female from the college campus, Mesilla Park, New Mexico, June 13th, collected by Prof. T. D. A. Cockerell.

No. 4370a, U. S. National Museum. One male collected in Madera Canyon, Santa Rita Mts., Arizona, June 14th, 1898, by Mr. E. A. Schwarz.

Co-type.—One female collected at Fort Grant, Arizona, July 12th, 1897, by Mr. H. G. Hubbard.

This species is remarkable on account of its small size and the prominent spots on the anterior wings. The abdomen is marked very much as in *B. Sackeni*. The short abdomen and inconspicuous appendages of the male are also peculiar.

OBSERVATIONS UPON BOMBYX CUNEA, DRURY, ETC.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Messrs. Dyar, Smith, and Grote have given us much interesting information concerning *Bombyx cunea*, Drury, and insects associated with it. I have hoped that further particulars would be forthcoming, for the position these insects have held in our Entomological lists has not been satisfactorily established.

It is very evident that much perplexity in regard to *cunea*, and the rest, has existed from Walker's day down to the present time.

Let us recall some of the facts connected with them that have come under our notice.

In 1770, Drury figured a moth which he named *Bombyx cunea*—probably from a fancied resemblance in the coloration of the insect to that of the spotted carriage-dog of Europe. He did not show the hind tibiæ of the insect.

Eighty-five years afterwards, Walker described certain insects that he found in the British Museum collections. Six of them from Georgia and two from New York he classified as *Spilosoma cunea*, believing them to belong to the species figured by Drury. Three of them from Georgia he described as a new species, under the name of *Spilosoma congrua*. He did not describe the hind tibiæ of either kind.

It was Harris who originated the generic term, *Hyphantria*. In his "Insects Injurious to Vegetation," edited by Flint (1862), p. 358, we read:

"This species was first described by me in the seventh volume of the *New England Farmer*, page 33, where I gave it the name of *Arctia textor*—the weaver—from the well-known habits of its caterpillar. Should it be found expedient to remove it from the genus *Arctia*, I propose to call the genus which shall include it, *Hyphantria*—a Greek name for weaver—and place in the same genus the many-spotted ermine-moth, *Arctia punctatissima*, of Sir J. E. Smith, which is found in the Southern States, and agrees with our weaver in habits."

Harris says nothing about the posterior tibiæ of either *textor* or *punctatissima*. The weaving habits of the larvæ suggested the names he gave: *Hyphantria* (Gr.), a female weaver; *textor* (L.), a male weaver. He believed that *punctatissima* and *textor* were distinct, specifically, one from the other.

It has since been discovered that there are slight structural differences of the hind tibiæ between insects of the genus Hyphantria and insects of the genus Spilosoma. (Smith, CAN. ENT., Vol. XXII., pp. 161, 163; Dyar, CAN. ENT., Vol. XXXI., p. 156.)

Drury's types have long been lost: Walker's have been destroyed, or are in hopeless confusion. We may, then, pertinently ask this question,—

Is it anything more than an assumption that Drury's moth would properly come in the genus Hyphantria?

Several writers have supposed *punctatissima* and *cunea* to be identical; but in reality we have nothing to guide us respecting *cunea* except Drury's figure, and Walker's description, which reads as follows:

"White; abdomen yellowish, white on the hind borders of the segments and towards the tip, and with one dorsal, one ventral, and two lateral stripes of black spots.

"Fore wings with four irregular oblique macular, more or less imperfect, brown bands.

"*Female.*—Hind wings with some brown submarginal spots. Length of the body, 5-6½ lines; of the wings, 13-18 lines." *Cat. Lep. Het. B. M.*, III., p. 669n. 7 (1855).

Unfortunately, we cannot attach as much importance to this description as we could wish, because of Prof. Grote's testimony as to the perplexity under which Walker laboured. (See CAN. ENT., Vol. XXXI., p. 268.) We are, therefore, thrown back mainly upon Drury's figure; *and we find it sufficient.*

In 1890, the Department of Agriculture, Washington, issued a report on the insects affecting forests trees, by Dr. A. S. Packard. In it is an account of the Fall web-worm, copied from Professor Riley's "Our Shade Trees and their Insect Defoliators."

On page 246, Riley is thus quoted:

"The moths vary greatly, both in size and coloration. They have in consequence of such variation received many names, such as: *cunea*, Drury; *textor*, Harr.; *punctata*, Fitch; *punctatissima*, Smith (Fig. 87). But there is no doubt, as proven from frequent breeding of specimens, that all of these names apply to the very same insect, or at most to slight varieties, and that Drury's name, *cunea*, having priority, must be used for the species."

Riley illustrated his position by cuts, under which we find:

"Fig. 87.—*Hyphantria cunea: a–j*, wings of a series of moths, showing the variations from the pure white form to one profusely dotted with black and brown."

Doubtless, Riley believed that he was portraying *cunea*, *textor*, *punctata*, and *punctatissima*, but strange to say,—

Not one of his cuts answers to Drury's figure!

I need not enlarge upon this. Let anyone who is interested in the matter take Riley's figure 87, and place it beside Drury's—either in the original or in Westwood's reprint—and the discrepancies will at once strike the eye.

In my former paper I spoke of a much-spotted Spilosoma taken in company with *S. congrua* at the Gomin Swamp. I have long known insects of this kind. The late Mr. F. B. Caulfield showed me one, twenty years ago; and I have met with other specimens since. No one acquainted with this moth would believe that it came from a Fall web-worm. Five specimens of it were taken in this locality in 1897. I have a pair of them in my collection, and I have just compared the male with Drury's figure in Westwood's reprint, and it agrees with it exactly—so exactly that one might imagine it to be the very specimen from which the engraver worked. I give a description of these insects:

Expanse of wings, 16½ lines; breadth of fore wing, 4 lines; breadth of hind wing, 4½ lines; length of body, 8 lines.

Thorax broad, white above and fluffy; abdomen yellow with white borders to the segments and a white tip, and with five longitudinal rows of black dots. Antennæ pectinated, white above and dark brown beneath; eyes brown; palpi dark brown; fore part of thorax under the head brown; front legs—femora luteous, spotted with black on the inner side; tibiæ and tarsi white on the outer side, dark brown on the inner; the tibiæ of the middle and hindmost pairs of legs spurred. Fore wings white with a faint testaceous tinge, and with four irregular broken rows of brown spots. The spots near the apex are somewhat elongated and wedge-shaped. From the apex to the middle of the hind margin, close to the fringe, is a row of brown dots. On the under side of the fore wings there are some dark brown apical dashes, and a brown lunette towards the middle of the wing, but nearer the costa than the hind margin. The hind wings have a brown lunette near the middle of the upper part, and

a subterminal row of spots and dashes—these are more conspicuous on the under side than on the upper.

In the female the dimensions and spots are much the same as in the male. The antennæ are of course without pectinations; the fore part of the thorax underneath is luteous; the black spots on the luteous femora are very conspicuous.

Here, then, apparently, we have Drury's insect.

I was inclined at first to think it an extreme form of *congrua*. It was taken at the same time and in the same locality as that insect, and in contour and size the two are very similar; but I find, on the other hand, that of all my twenty-eight bred specimens of *congrua*, not one has anything like the spotted underwing that is so remarkable in Drury's figure. Six of them have a faint dot in the upper part of the secondaries, just such as is given in cuts *i* and *j* in Riley's "Fig. 87," and that is all.

The question of locality does not come in here. We know not how wide or how restricted a field this true *Spilosoma cunea*, Drury, may have. The species is rare, but it exists!

With regard to *Spilosoma congrua*, we have these particulars:

(a) Walker described it.

(b) Prof. Grote found it in Walker's keeping; spoke to him about it; made a further description of it.

(c) Dr. Hulst and others have bred it.

(d) S. Antigone has been found to be identical with it.

The whole matter seems to be very clear; and our lists should read:

SPILOSOMA, Steph.
cunea, Drury.
congrua, Walker.
Antigone, Strk.
HYPHANTRIA, Harris.
Punctatissima, S. & A.
textor, Harris.

A COCCID FROM THE FAR NORTH.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Eriococcus borealis, n. sp., ♀.—Sacs on twigs, closely felted, rather rough, broad oval, grayish-white, about 2½ mm. long. Female oval. Mounted specimens full of embryos are nearly 3 mm. long. Gives no red colour on boiling in caustic potash. Skin after boiling, greenish or

grayish, thickly beset with round to oval hyaline spots. Dermal spines only moderately numerous, 27–45 μ long, the shorter ones more numerous than the longer. Caudal lobes long, brownish; irregularly cylindrical, about 42 μ broad and 90 μ long. Buccal apparatus about 120 μ broad; rostral loop rather short; mentum rather long. Antennæ and legs pale brown; antennæ varying from 7- to 8-jointed, the joints after the first measuring as follows in μ:—8-jointed form: (2.) 30, (3.) 45, (4.) 27, (5.) 24, (6.) 24, (7.) 27, (8.) 36. Formula 382 (47) (56). 7-jointed form: (2.) 42, (3.) 54, (4.) 51, (5.) 24, (6.) 24, (7.) 29. Formula 3427 (56). Hind legs: coxa 120, femur with trochanter about 180, tibia 111, tarsus 126, claw 26 μ Anterior legs: tibia 90, tarsus 111 μ. Tarsus always longer than tibia. Young dark crimson, with a fringe of glassy rods.

Hab.—On willow *(Salix)*, Dawson City, 64° N. Lat., collected by Mr. John Morley; sent to me by Mr. Alex. Craw. *E. borealis* is peculiar for the dermal markings, and the antennæ varying from 7 to 8 joints.

LEPISESIA ULALUME, STRECKER, IN BRITISH COLUMBIA.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

In a box of Lepidoptera sent to the Division of Entomology, for identification, by Mr. W. A. Dashwood-Jones, of New Westminster, B. C., was a specimen of the above named sphingid. The specimen was kindly named by Dr. J. B. Smith, who wrote of it, saying: "It is a genuine rarity, and in 1888 there was not a specimen known save the type. If I remember rightly, this is the first specimen other than the type that I have ever seen." Mr. Dashwood-Jones states that this season he took seven specimens of *ulalume;* and, further, that he takes them every year in his garden, on white lilac blossoms. He mentions that he has never seen this moth anywhere else, but that for a few days in spring they appear to be fairly plentiful. Dr. Fletcher tells me that three years ago, when examining some insects in the Department of Agriculture of British Columbia, he saw two specimens, taken by Mr. W. A. Lawes at Enderby, B. C., which he now thinks were *ulalume*, but which at the time he thought were large specimens of *flavofasciata.* Mr. Dashwood-Jones has kindly presented to the Division a second specimen, which has a flush of yellow on the disk of the secondaries.

OBITUARY.

On the 16th of October there passed away, at Peterborough, one of the original members of the Entomological Society of Ontario. The Rev. Vincent Clementi, B. A., died at the age of eighty-seven years. He was a clergyman of the Church of England, but had retired from active service some years ago, in consequence of failing eyesight and other infirmities. Born in England, the son of a famous musical composer, U. Clementi, Esq., and educated at the University of Cambridge, he came to Canada in 1855 and settled in Peterborough. In 1863 he was appointed rector of Lakefield, where he remained for eleven years; he then became rector of Lindsay, and on his retirement returned to Peterborough to spend the rest of his days. He was an active member of the Masonic Society, and rose to be Chaplain of the Grand Lodge of Ontario. In his younger days, and indeed throughout the whole of his life, he was devoted to natural history, horticulture, and art, and was especially interested in entomology. He contributed occasionally to the early volumes of this magazine, and took a hearty interest in the welfare and success of the Society. His water-colour drawings of insects were remarkable for their accuracy and beauty of execution. He was held in the highest respect and regard by all who knew him, and died in a good old age, a devout and upright man. To his sorrowing widow, the aged partner of his life, we beg to tender our deep and respectful sympathy.

BOOK NOTICES.

General Index to Miss Ormerod's Reports on Injurious Insects, 1877 to 1898.—By Robert Newstead, F. E. S. London: Simpkin, Marshall & Co. (Price, 18 pence.)

For twenty-two years Miss Ormerod has been issuing her valuable Reports of Observations on Injurious Insects, and in them has furnished a most useful mine of information regarding all the principal insects that have been productive of injury in the British Isles during this long series of years. To render this mine readily available at any moment, a very satisfactory index has been prepared by Mr. Newstead. The greater part of it consists of a "General Index," in which reference is given to every insect treated of in the Reports under its scientific name, with references also to habits, modes and subjects of attack, etc. This is fol-

lowed by a "Plant Index," with references to the insects attacking each; a similar "Animal Index," and a third comprising other matters attacked, such as bones and leather, seeds, etc.

We are glad to learn from her preface to the volume that Miss Ormerod is about to begin a Second Series of Reports in a somewhat different form. We earnestly hope that she may long be spared to continue her noble work.

INDEX OF SPECIES TO KIRBY'S SYNONYMIC CATALOGUE OF LEPIDOPTERA HETEROCERA.—Vol. I., Sphinges and Bombyces. By Herman Strecker, Ph. D., Reading, Pa. (Price, 50 cents.)

This pamphlet, of forty-five pages, represents an enormous amount of tiresome and painstaking work, and will surely be welcomed by everyone who has occasion to consult Kirby's great catalogue of the two families mentioned above. Without this index, the nine hundred pages and over are, as Dr. Strecker states, a sealed book to almost everyone; an index to genera alone is comparatively useless in consequence of the changes in nomenclature that are constantly taking place; it is by the specific name that an insect is really known. The index contains fully 8,000 names, and gives the page or pages in the catalogue where each one occurs. For instance, to take one or two names at random, Affinis has twenty references, Basalis thirty-two; but the great majority only one. The thanks of all students of the Lepidoptera are certainly due to Dr. Strecker, and they can best manifest their gratitude by sending to him for a copy, in order to save him from pecuniary loss.

THE NORTHWEST (CANADA) ENTOMOLOGICAL SOCIETY.

The first annual meeting of this Society was held at Lacombe, Alberta, on Tuesday, November 7th, and was well attended by members, agriculturists, and others. A full account of the proceedings will be published in the Annual Report of the Entomological Society of Ontario. The following were elected officers for the ensuing year:

President—Percy B. Gregson, Esq., Waghorn, Alberta.

Vice-President—Rev. Matthew White, Lacombe.

Librarian-Curator—Arthur D. Gregson, Esq., J. P., Waghorn.

Secretary-Treasurer—Percy B. Gregson, Esq.

Council—Rev. J. Hinchliffe, Red Deer, Alta.; William Wenman, Esq., Red Deer; T. N. Willing, Esq., Olds, Alta.; F. H. Wolley-Dod, Esq., Calgary, Alta.

Mailed December 23rd, 1899.

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