56.57(78.8)

Article XXV.— FOSSIL INSECTS AND A CRUSTACEAN FROM FLORISSANT, COLORADO.

By T. D. A. Cockerell.

TRICHOPTERA.

Derobrochus typharum sp. nov.

Length 13 mm.; anterior wing 12½, posterior nearly 11; breadth of anterior wing 3½ mm.; ferruginous, wings clear or nearly so, minutely and sparsely hairy, with ferruginous veins; thorax with a moderate number of stout black bristles, about 595 μ long; antennæ rather thick, diameter near middle about 235 μ, with transverse rows of minute hairs, about 40 μ long; middle (?) tibia with two apical spurs. This agrees with Scudder's definition of *Derobrochus*, in that it is a Hydropsychid, with apical forks one to four present, and the fifth absent. It is well preserved, and I think there is no doubt whatever that the cubitus is simple in both upper and lower wings. (Scudder says that the fifth apical *cell*, *i. e.* the third fork, is absent, but his figures contradict this, and it is evident that the fifth fork is intended.) The new species is larger than any of Scudder's *Derobrochus* forms (some of which are very dubious, see Bull. Am. Mus. Nat. Hist., XXIII, p. 610), and differs in the details of the venation. In spite of the excellent preservation, I cannot see any cross-veins, nor are the longitudinal ones deflected at the points where they might be expected; it really seems, therefore, that the discoidal and median cells were open apically.[1]

Anterior wing. Subcosta and radius as in *Hydropsyche*, the latter a little deflected downwards at the beginning of the scarcely darkened pterostigma; both forks of radial sector very long, especially the lower, measured on the lower nervure, the first fork is about 3485 μ, the second 5950; forks of the media (third and fourth forks) also long, base of third a short distance basad of level of base of first, base of fourth a slightly greater distance basad of level of base of second; cubitus very straight.

Posterior wing. Venation as in anterior wing, with the same forks etc.

Hab. — Miocene shales of Florissant, Station 14 (*Geo. N. Rohwer*).

On the reverse side of the slab is a specimen of *Typha lesquereuxi* Ckll. The second fork is not nearly twice as long as third, and the first fork is much shorter than second; from these and other characters the insect comes nearest to *D. craterœ* in Scudder's table, but the anterior wings of *D. craterœ* are only 8 mm. long. The size of the first fork at once separates *D. typharum* from Scudder's *Litobrochus*.

[1] There is the faintest suggestion of a deflection on upper side of second fork, just basad of level of base of first; this may perhaps indicate the place of a former cross-vein.

Indusia cypridis sp. nov.

Larval case cylindrical, perfectly straight, about 11 mm. long (end broken) and 2½ broad, composed of *Cypris florissantensis* shells and small fragments of biotite.

Hab.— Miocene shales of Florissant, 1909 (*George Sternberg*).[1] Am. Mus. Nat. Hist., No. 10190.

Fig. 1. *Indusia cypridis* sp. nov., with *Cypris florissantensis* sp. nov.

This is of interest, because Scudder wrote (Tertiary Insects, p. 178) as follows: "That in the abundant fauna found in the lake basin of Florissant, including, as we see, a large number of caddis-flies, not a single larval case should have yet been found seems a little remarkable, and the more so since not a few belong to groups, the larvæ of which are known to prefer standing to running water."

Hydropsyche scudderi *Ckll.*

Florissant, 1909 (*Geo. Sternberg*). Am. Mus. Nat. Hist.

EPHEMEROIDEA.

Ephemera howarthi *Ckll.*

Florissant, 1909 (*Geo. Sternberg*). Am. Mus. Nat. Hist.

ODONATA.

Æshna larvata *Scudder.*

Florissant, 1909 (*Geo. Sternberg*). Am. Mus. Nat. Hist.

HYMENOPTERA.

Eriocampa pristina sp. nov.

Length about 10 mm.; anterior wing about 7½; wings clear hyaline; head and thorax black, abdomen light ferruginous; venation normal, except that I cannot see any discal cells in the hind wings, and although the part is not very well preserved, the outer bounding nervures, if present, must have been very slight. In Rohwer's table of fossil *Eriocampa* (Bull. Am. Mus. N. H., 1908, p. 592) this runs out, because

[1] The Sternberg collection was obtained in 1909 by George Sternberg, with the assistance of Terry Duce and Willard Rusk.

the second cubital or radial is much longer than first on cubitus, and yet not nearly twice as long, and in addition the clear wings separate it from *E. scudderi*, and the larger size from *E. bruesi*. In the following account of the wing, all measurements are in microns: Costal cell large (as in *Eriocampa*, not as in *Pseudosiobla*), and apparently with a cross nervure; stigma large; first transversocubital produced to costa would make a large angle (as in *Eriocampa*, not as in *Eriocampoides*); sides of first discoidal cell approximately parallel (as in Emphytinæ, not as in Phyllotominæ); third transversocubital strongly arched inwards; lower apical corner of third discoidal cell a little less than a right angle; lanceolate cell with an oblique cross nervure and strong subbasal contraction, as is normal for the genus.

End of stigma to end of marginal cell, 1955; end of third submarginal to end of marginal 1120; end of cross nervure on marginal to upper end of third transversocubital 305; end of cross-nervure on marginal to upper end of second transversocubital 715; second submarginal on marginal 885; first submarginal on first discoidal 476; second submarginal on first discoidal 305; third submarginal on third discoidal about 290; basal nervure on first discoidal 1190; first discoidal on third 680; lower end of basal nervure to upper end of transversomedial 510; second discoidal on first 645; length of transversomedial 545; transversomedial to upper end of cross-nervure of lanceolate cell 985.

Hind wing. End of lanceolate cell to lower apical corner of median 325; length of apical side of median 340; median on lower discal (this cell however apparently incomplete on outer side) 580; subcostal on lower discal 680. Compared with Macgillivray's figure of *E. ovata* (Proc. U. S. Nat. Mus., XXIX, pl. XXVIII) not only do the outer nervures bounding the discal cells seem to be absent, or are at least very weak, and obliterated in the fossil (as in *Emphytus*), but there are other differences in detail. In *E. ovata* the lower discal on the subcostal is about twice as long as on the median cell; in *E. pristina* it is only about a sixth longer.

Hab.— Miocene shales of Florissant 1909 (*George Sternberg*). Amer. Mus. Nat. Hist., No. 10314.

Geotiphia sternbergi sp. nov.

♀ (apparently); length 17½ mm., anterior wing about 11½, width of head about 3¼, of thorax 4, of abdomen about middle 5, length of abdomen 10¾ mm.; flagellum thick, tapering, formed exactly as in female *Plesia*; inner orbital margins gently concave; front roughened or punctured, but thorax apparently smooth or nearly; the head and thorax black; posterior margin of prothorax straight or nearly, mesothorax short, as in related genera, but longer than prothorax in middle line; parapsidal grooves distinct; abdomen large, broadly sessile, black, apparently ferruginous at extreme sides, shaped as in the Scoliids; legs black or nearly; hind femora very stout, apparently much as in *Plesia*; hind tibiæ about 2¾ mm. long, thick, probably spinose or dentate on outer side, but this part is not clearly preserved; hind spur well developed; hind tarsus about 4 mm. long, the joints produced apically as in *Plesia*; wings strongly reddish, the stigma dark fuscous, nervures ferruginous. The venation agrees in general with that of *G. foxiana*, the type of the genus, but the third submarginal cell is very large, and its apex is level with the tip of the marginal; the first discoidal is very long and narrow. In the following description all measurements are in microns: costal cell well developed, fuliginous; stigma well developed but elongate, yet little intruding in marginal cell; marginal cell ending very obtusely, the apex practically narrowly truncate, the upper end of

the truncation closely adjacent to costa; length of marginal cell about 3145, its depth 970; upper end of basal nervure about 1360 from stigma; basal nervure meeting transverso-medial; lower section of basal straight, 595 long; length of first submarginal cell 2550; of second submarginal, 1190 above and 2210 below; first recurrent nervure reaching second submarginal cell 850 from base, second reaching third submarginal (at right angles) 375 from base; first transverse-cubital nervure very oblique, strongly bent just before its lower end; outer side of third submarginal greatly bulging, rounded; diameter or length of third submarginal on marginal 1360, below 1190, but in middle about 1700; first discoidal cell 3060 long and 765 greatest depth.

Hab.— Miocene shales of Florissant, 1909 (*George Sternberg*). Am. Mus. Nat. Hist., No. 10235.

This fine species is very distinct from *G. foxiana* (Bull. Mus. Comp. Zool., Vol. L, No. 2, 1906, p. 51) by its large size and some of the details of the venation, but I think it is unquestionably congeneric.

Mr. Rowland E. Turner, who has paid great attention to the living relatives of these insects, has very kindly sent me the following discussion of *Geotiphia:* "*Geotiphia* seems to be very near some of the South American species of *Anthobosca*, especially *iheringii* Sauss., the female of *antennata* Sm. I think it should certainly be placed in Ashmead's family Cosilidæ rather than in his Tiphiidæ. You may have seen Fox's remarks on the differences in the ungues and legs of *Cosila* in his description of *C. donaldsoni*, and eventually I think it may be necessary to restrict the name *Anthobosca* to the Australian species, but where the sexes differ so widely I am not in favor of splitting until more species are paired. Probably *Lithotiphia* also belongs to the Cosilidæ, but seems to be more distinct. I quite agree with you in regarding these as primitive forms as compared with the modern Scoliidæ and Thynnidæ, both of which are probably derived from ancestors more nearly resembling *Cosila*, which have died out in the northern hemisphere without developing in the direction of the Thynnidæ, the one or two species of that family described by Ashmead from S. California being probably stragglers from the S. American fauna. The remarks in your paper on the spines of the hind tibiæ are useful; I have been recently studying this character in the Thynnidæ, and hope to be able to make some use of it in generic division. I have not as a rule found differences in the neuration such as you give in your table of much value in the Scoliidæ. The proportionate length of the marginal and third submarginal cell differs very much in the males of *Tiphia* and in the females of *Anthobosca*, and I do not think it can be used as more than a specific character. If your genus *Geotiphia* stands it will I think have to include most of the S. American *Anthobosca*, from which *Cosila chilensis* Guér. may be separable. The neuration in the latter species is rather peculiar, the second cubital cell receiving both recurrent nervures in the male specimens I have seen, but

only one in the females. The ventral constriction between the first two abdominal segments is absent in many of the Thynnidæ, especially in the females." (Litt. Aug. 3, 1908.)

Geotiphia halictina sp. nov.

Length about 8 mm., anterior wing about 4½; head and thorax black, abdomen ferruginous, the latter extending about 2 mm. beyond the wings; robust form and sessile abdomen as in *G. sternbergi*; from its small size and rather robust form it looks exactly like a bee, *Halictus* or some near relative; wings reddish-hyaline, nervures ferruginous; legs ferruginous; thorax not evidently punctured or otherwise sculptured.

The venation is practically as in *G. sternbergi*, but the very obtuse end of the marginal cell extends a little beyond the third submarginal, and the second recurrent nervure joins the third submarginal cell (at right angles) a little beyond the middle. The following measurements are in microns: length of marginal cell 1225; substigmatal part of marginal about 255; upper apical corner of third submarginal to apex of marginal 305; second submarginal on marginal 325; length (or diameter) of third submarginal in middle about 630.

The venation of the hind wing is well preserved, and agrees in the main with *Plesia*, differing however as follows:—

(1.) The transversocubital nervure, instead of being vertical, is oblique, the lower end more basad.

(2.) The lower end of the cubitobasal nervure, instead of failing to reach the transversomedial, goes about 150 μ basad of it, and the transversomedial is more oblique.

Hab.— Miocene shales of Florissant (*Univ. of Colo. Exped.*). On the same slab, close to the insect, is a leaf of *Populus lesquereuxi* Ckll.

Selandria sapindi n. sp.

Length about 8 mm.; anterior wing about 7; abdomen about 5, oblong; the head and thorax were apparently dark, the abdomen pale, with a broad dark band near the apex, and indications of narrow bands or marks at the sides of the first two segments; wings clear, nervures dark ferruginous. The venation of the anterior wings is well preserved, and from the form of the lanceolate cell, and other characters, indicates a member of the Selandriinæ as restricted by Macgillivray. The rather short and broad abdomen, and the much thickened costa, bulging before the stigma, indicate the genus *Selandria*. The character of the venation may be understood by comparison with MacGillivray's figures of *Stromboceros* and *Strongylogaster* in Proc. U. S. Nat. Mus., XXIX, pl. xxix, figs. 50 and 51.

Costal region much thickened, the costal cell a mere streak; stigma very thick, obtuse at apex, deeper in proportion to its length than in either of Macgillivray's figures; marginal cell ordinary, tapering, the cross nervure very oblique and rather arched, as in *Strongylogaster*; first s. m. shaped as in figure of *Strongylogaster*, the cubital nervure also strongly bent downwards near origin; t. m. more remote from b. n. than in either of Macgillivray's figures.

The hind wings are partly visible, and all that can be seen is quite normal. The discoidal cell has a subvertical base, as in the figure of *Stromboceros*, not as in *Strongylogaster*.

The following measurements of the anterior wing are in microns:

End of stigma to end of marginal cell	2210.
Upper end of second t. c. to lower end of cross-nervure of marginal cell	630.
Lower end of cross-nervure of marginal cell to upper end of third t. c.	390.
Second s. m. on first discoidal	410.
Second s. m. on third discoidal	680.
Third s. m. on third discoidal	340.
First discoidal on submedian cell	900.
First discoidal on second discoidal	425.

Hab.— Miocene shales of Florissant, Station 14, in red shale (*Geo. N. Rohwer*).

The insect is almost touching a leaflet of *Sapindus*. Close to the leaflet is a small shell, *Planorbis florissantensis* Ckll.

This is the first Selandriina from Florissant. An undescribed *Selandria* is said to occur in Baltic Amber.

ORTHOPTERA.

Capnobotes silens (*Scudder*).

A single tegmen overlaps the reverse of the type leaf of *Sambucus newtoni* Ckll. It is 33½ mm. long as preserved, but the base is lacking, and the total length would no doubt be 35 to 38 mm.; the width near middle is about 7 mm.; pale, without markings, but anal margin infuscated. The venation is like that of the recent *C. fuliginosus*, but the costal field is narrower apically (its width only about one mm., some 15 mm. from apex); in the basal field the media is closer to the radial sector. The radial sector separates from radius 27¾ mm. from apex of tegmen.

Hab.— Miocene shales of Florissant (*Geo. N. Rohwer*). Scudder's type (*Locusta silens*) was a little larger. Scudder's figure gives no idea of the venation.

DIPTERA.

PTYCHOPTERIDÆ.

Bittacomorpha miocenica sp. nov.

♂. Length about 8 mm.; wing 6¼; hind legs about 16; thorax elevated; abdomen strongly clavate; as preserved the whole insect is ferruginous, and there is no evidence that the legs were bicolored; wings without evident markings (a doubtful cloud at end of basal cells and a little beyond), veins ferruginous; venation perfectly typical for *Bittacomorpha*, but second submarginal cell about as long as its stem (much shorter in *B. clavipes*), and wing not so long and narrow as that of *B. clavipes* (though longer in proportion to body). Length of second submarginal cell

about 1785 μ, of its stem about 1615; lower side of posterior cell only moderately bent; end of basal cells midway between base and apex of wing.

Hab.— Miocene shales of Florissant, Station 13 B (*Geo. N. Rohwer*).

Among the recent species, this seems to be nearest to *B. sackenii*. Although it is unquestionably a *Bittacomorpha*, it is somewhat less specialized than the living forms, as shown by the more normal proportions of wings and body, and longer second submarginal cell. Needham (Bull. 124, New York State Museum, p. 244) and Handlirsch (Ann. k. k. Nat. Hofmuseums, Wien, 1909, p. 269) agree in recognizing the Ptychopteridæ as a distinct family. It is divided into subfamilies and genera as follows:

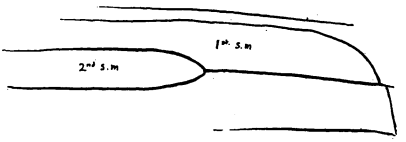

Fig. 2. *Bittacomorpha miocenica* sp. nov.

(1.) Etoptychopterinæ.
Etoptychoptera Handl. One species. "Oligocene" of British Columbia.

(2.) Ptychopterinæ.
Ptychopterula Handl. One species. Upper Oligocene of Bohemia.
Ptychoptera Meigen. Eight living species, five European, three North American.
Bittacomorpha Westw. Four living species in North America; one in the Miocene of Colorado.

(3.) Macrochilinæ.
Macrochile Lw. One species. Oligocene (amber) of Europe.

(4.) Tanyderinæ.
Protanyderus Handl. *P. vipio* (O. S.). Living in California.
Protoplasa O. S. *P. fitchii* O. S. Living in E. United States.
Tanyderus Phil. *T. pictus* Phil. Living in Chile.
Radinoderus Handl. *R. ornatissimus* (Dolesch.). Living in Amboina.
Mischoderus Handl. *M. forcipatus* (O. S.). Living in New Zealand.

Thus the group appears to be an old one, represented to-day by scattered fragments.

Tipulidæ.

Tipula needhami sp. nov.

♀. Length 20 mm. or a little over; wing 18 mm. long, 4½ deep; eyes 425 μ apart; wings uniformly grey, not shaded along the veins, with the usual slight brownish stigmatal spot; abdomen pale reddish, with a median stripe and broad oblique lateral marks; middle femur 11 mm., its tibia slightly over 11; hind femur 12¾ mm., its tibia 13¾, its tarsus over 17 (end missing); the following wing-measurements are in microns; length of discal cell about 1990, its greatest depth 900; stalk of second posterior cell 510; length of first marginal cell 3800; first marginal on first basal 2890; combined depth of basals near end 2370.

Hab.— Miocene shales of Florissant (*Geo. N. Rohwer*).

Dedicated to Professor J. A. Needham, in recognition of his important contributions to the knowledge of the Tipulidæ. In Scudder's table (Proc. Amer. Phil. Soc., XXXII, p. 63) this runs nearest to *T. evanitura*, but is larger, with longer legs, and appears to be distinct. The first marginal cell is unusually long. *Tipula* was remarkably abundant at Florissant, and while some of the described species are possibly of doubtful validity, the present list (16 species) will not be much if at all reduced.

Scudder remarks on the large proportion of extinct genera among the Florissant Tipulidæ. It is to be noted, however, that except for the evolution of distinct species, the genera common to the Florissant Miocene and the present American fauna have shown no appreciable advance. Thus the fauna has changed by the extinction of certain genera and the arrival of others from elsewhere.

It would be interesting to compare the existing Tipulid fauna of Florissant with the fossils, but unfortunately it is scarcely known. The following species were collected by Mr. S. A. Rohwer at Florissant, and determined by Mr. Coquillett: *Helobia hybrida* Meig.; *Erioptera caliptera* Say: *Tricyphona vitripennis* Doane; *Ptychoptera* sp. I have taken *Molophilus comatus* Doane on Pike's Peak, which is not far from Florissant.

Tipula heilprini *Scudder.*

The American Museum contains specimens collected at Florissant by George Sternberg.

Tipula rigens *Scudder.*

North end of Fossil Stump Hill, Florissant, layer 16 (*W. P. Cockerell*).

Tipula clauda *Scudder.*

Florissant, 1909 (*Geo. Sternberg*). Amer. Mus. N. Hist.

ASILIDÆ.

Taracticus contusus sp. nov.

Length about 9 mm., black, the abdominal segments with the posterior half or somewhat less pallid ventrally; legs rather robust; wings clear, veins dark. The venation is practically normal for *Taracticus*; compared with *T. octopunctatus* (Trans. Am. Ent. Soc., XXXV, pl. xi, p. 3) it differs only by the narrower second submarginal cell, which flares only a little at its apex, and is there not quite so broad as the end of the first posterior; also, the fourth posterior seems to be more contracted, but its lower part, along with the anal, is missing. The discoidal on second posterior is rather greater, instead of less, than on third posterior, a feature which agrees sufficiently with *Taractacus*, but disagrees with *Heteropogon* and *Pycnopogon*. The

anterior cross-vein is 765 μ from base of discal cell, and 560 from its apex; in being beyond the middle of discal cell it agrees with a little group of genera including *Taractacus*, *Heteropogon*, *Saropogon*, &c, but disagrees with many others. The first submarginal cell goes more basad than the discoidal, which is another good character, excluding various genera. From the end of the auxiliary vein to the end of the first vein is 1530 μ; from the end of the first to the level of the apex of the wing is 1275.

Hab.— Station 14, Miocene shales of Florissant.

The genus *Taracticus* to-day inhabits the eastern United States. I have a note of the occurrence of an undetermined species in New Mexico, however.

While on the Dasypogonine Asilidæ, I will add a couple of records of Rocky Mountain species to those given by Back in his revision.

Stenopogon breviusculus Lw. Las Vegas, New Mexico, June 19 (*Martin D. Cockerell*). Back only gives California.

Deromyia angustipennis Lw. Common at Boulder, Colorado, preying on *Apis mellifera ligustica* (Spin.) and *Polistes variatus* Cress. I noted that when attacking *Polistes* it held it "at legs length", so that it could not sting, and at an opportune moment thrust its beak into the wasp's thorax.

NEMESTRINIDÆ.

Hirmoneurites gen. nov.

Large robust flies with short proboscis; eyes bare; sides of abdomen tufted with hair; venation in most respects like that of *Hirmoneura*, but with the first basal cell rather broadly truncate at end, and the second posterior divided into two by a vertical cross-nervure; three submarginal cells, the third broadly truncate at base.

Hirmoneurites willistoni sp. nov.

Length about 20 mm.; very robust; width of head 5 mm., of thorax 7, of abdomen near base 7½; abdomen beyond middle rapidly tapering to a pointed apex; head and thorax black, abdomen dark reddish, sides of abdominal segments with abundant black hair; wings about 14 mm. long, hyaline with dark veins; no sign of any long proboscis (a slight superficial appearance of one is caused by a small gnat, which is placed so as to touch the side of the head); eyes large, about 1½ mm. apart on front, naked, the facets about the same size as in *Hirmoneura occultator*; legs ordinary, not hairy, width of hind femora near end about 715 μ.

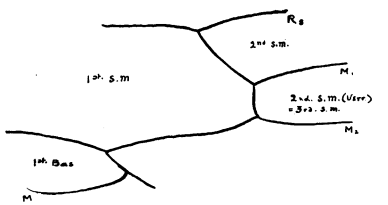

Fig. 3. *Hirmoneurites willistoni* sp. nov.

Subcosta (mediastinal vein) and radius (first vein) normal, ending a little over 1 mm. apart, and the radius about 2 mm. from apex of wing; radial sector (second

vein) as in *Hirmoneura*, a little curved upwards at end, its middle section about 3 mm., and apical a trifle more; outer radiomedial cross-nervure (separating first and second submarginal cells) present, as in American *Hirmoneura* (but not in *H. obscura*, the type of the genus), not very oblique (not very different from that of *Hirmoneura vulcanica*); cell between apical forks of media (third submarginal) broadly truncate at base, as in *H. vulcanica*, the cell broader near base than beyond, herein shaped as in *H. melanderi*; media dislocated at diagonal vein, the basad portion about 220 μ *below* the apical (in other genera it is either not dislocated, or is *above*, but is a trifle below in *H. obscura*), hence the first basal cell is truncate at end and the discal cross-vein is well defined: upper branch of cubitus not dislocated by diagonal vein, but lower branch dislocated about 135 μ, the basad section the lower (practically as in *H. obscura*); diagonal vein continued to margin, which is indented at its end; cubital branches beyond diagonal vein (bounding second posterior cell) ending separately on margin (about 340 μ apart), but about 1½ mm. from diagonal vein joined by a vertical transverse cross-vein, the upper branch being drawn into a wide V at the cross-vein; this encloses an extra cell, making two between the cubital branches (evidently normal, being quite the same on both sides); the branching of the cubitus is not very distinctly preserved, but the stem is continuous with the *upper* branch, and the lower is bent downwards, perhaps much as in *Fallenia fasciata*.

Hab.— Miocene shales of Florissant, 1909 (*George Sternberg*). Am. Mus. Nat. Hist., No. 10244.

I have used the nomenclature of the venation of my earlier papers on Nemestrinidæ (*cf.* Trans. Amer. Ent. Soc., XXXIV, plate xvi), which is based on the supposition that the venation of this family is much more primitive than has generally been supposed. This is supported by the occurrence of a Nemestrinid in the Jurassic rocks of Bavaria. Some time ago I sought Dr. S. W. Williston's opinion on this matter, and while he was not in a position to take it up in detail, his comments are so illuminating that I take the liberty of quoting them. They were written from the field in Texas, twenty miles from the nearest post office, and of course without books or specimens at hand.

"I at once saw that if your Nemestrinid veins were correct they must apply to *all* Diptera, and that the subject is impossible of proof pro or con, for the reason (among others) that the anterior cross-vein and the vein you would call the cross-vein are *never* absent in Diptera when there is a functional venation. When I grasped the *general* applicability of the theory, it struck me as not unreasonable,— but unprovable! There is this much against it,— the second vein sometimes arises from beyond the cross-vein (Stratiomyidæ, etc.) that is, the cross-vein connects the second with the fourth. The third and fourth veins may be coalescent (that is, the cross-vein obsolete) in the Tipulidæ, Bibionidæ, Mycetophilidæ, etc. The Nemestrinidæ is one of the *very* few instances among Diptera in which there have been *apparent* additions to the primitive venation. Other examples are found among the Cyrtidæ, Bombyliidæ (and Asilidæ possibly); every-

where else in Diptera specialization has been by *reduction.*" (Litt. Sept. 17, 1908.)

The new species is named after Dr. Williston, in recognition of his important contributions to the knowledge of the Nemestrinidæ of North America.

According to Verrall's classification, the North American *Rhynchocephalus volaticus* Williston would go in *Nemestrina;* but no doubt the structure of the mouth-parts is more important in this family than any detail of the venation, and hence we are disposed to adhere to Williston's generic reference.

The following key separates the Tertiary and Recent genera of Nemestrinidæ found in the Palæarctic and Nearctic regions.

Proboscis long . . . . . 1.
Proboscis short . . . . . 5.
1. Only two submarginal cells, the outer radiomedial cross-vein lacking; proboscis projecting anteriorly. (American Miocene) . *Palembolus* Scudder.
Three submarginal cells . . . . . 2.
2. Diagonal vein extending to wing-margin . . . . . 3.
Diagonal vein not extending to wing-margin . . . . . 4.
3. Proboscis projecting anteriorly (Palæarctic).
Nemestrinus Latr. 1802 (*Nemestrina* Latr. 1809).
Proboscis not projecting anteriorly (Florida)
Rhynchocephalus subg. nov. **Nemestrinopsis** (type *R. volaticus* Will.).
4. A short subtriangular cell (between branches of media) adjacent to end of discal cell; longitudinal veins more or less uniting near apex of wing. (S. Europe; N. Africa) . . . . . *Fallenia* Meig.
Cell between branches of media open or closed, but always long; if longitudinal veins unite apically, it is always the branches of the media or of the cubitus with each other. (Russia; Persia; N. America) . . *Rhynchocephalus* Fisch.
5. Second posterior cell divided into two by a vertical cross-nervure: first basal cell rather broadly truncate at end (American Miocene) *Hirmoneurites* Ckll.
Second posterior cell not so divided 6
6. Radial sector confluent with upper branch of media (second and upper branch of third veins confluent). (Spain; Africa) . . . . . *Symmictus* Lw.[1]
Radial sector not thus confluent with media . . . . . 7.
7. Outer radiomedial cross-vein absent; anal cell widely open (Central Europe and Transcaspia) . . . . . *Hirmoneura* Meig.
Outer radiomedial cross-vein present; anal cell narrowly open or closed (N. America, Miocene and Recent) . *Hirmoneura* subg. *Parasymmictus* Bigot.

It is a question whether *Nemestrinopsis* and *Parasymmictus* (in the broad sense here employed) should not be regarded as valid genera. I give a check-list of the North American species. Those marked with an

[1] A figure loaned to me by Dr. Williston, labelled *Colax*, shows essentially the same venation, but the second submarginal cell is open, whereas in *Symmictus* it is closed.

asterisk are Miocene. It is evident that the family was formerly much more abundant in this country than at present, as more than twice as many are known from Florissant as from any single region to-day.

PALEMBOLUS Scudd.
**florigerus* Scudd.
RHYNCHOCEPHALUS Fisch.
sackeni Willist. (W. States).
subnitens Ckll. (Kansas).
volaticus Willist. (Florida).
HIRMONEURITES Ckll.
**willistoni* Ckll.

HIRMONEURA Meig.
clausa Osten Sacken (Texas).
brevirostris Macq. (Yucatan).
psilotes Osten Sacken (Mexico).
flavipes Willist.
texana Ckll. (Texas).
**vulcanica* Ckll.
**melanderi* Ckll.
**occultator* Ckll.

STRATIOMYIDÆ.

Nemotelus prisculus sp. nov.

♀. Length about or nearly 10 mm.; wing about 8; width of abdomen in middle about 4; head seen from above shaped as in *Nemotelus*, the snout well developed, the antennæ probably normal but not well preserved; eyes bare, 730 μ apart; thorax black, with black hair, which is sparse but rather long; abdomen broad, tapering at apex, as in *Nemotelus*, black, with the apical two segments ferruginous, no light markings visible, but as only fragments of the surface are preserved, they cannot be positively said to have been absent; hind legs extending about 1½ mm. beyond end of abdomen, when held in normal position; wings reddish, darker about end of costal cell and a little beyond; venation essentially as in *Hermetia*. On the wing alone, I should place this in *Hermetia*, but the form of the head and body are not at all as in *Hermetia*, but agree well with *Nemotelus*. Possibly the insect is deserving of a separate generic name. In the description of the wing, the measurements are in microns. End of first vein about 1360 from end of upper branch of third; end of upper branch of third about 680 from end of lower branch; end of lower branch of third about 1020 (obliquely) from apex of wing; discal cell on second posterior about 170; end of anal cell to wing margin about 170; width of third posterior cell toward apex about 510. Compared with *N. uliginosus* (*cf.* Verrall, British Flies, V, p. 56) the following differences are apparent:

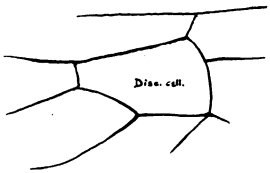

Fig. 4. *Nemotelus prisculus* sp. nov.

(1.) Outer nervures strong, as in *Hermetia*.
(2.) Third vein approaching apex of wing, the end of its lower branch much nearer to apex than to end of first vein. This also agrees rather with *Hermetia*.
(3.) Discal cell shaped essentially as in *Hermetia*, that is more triangular or subpyriform than in *N. uliginosus*.
(4.) Third posterior cell slightly narrowed apically, also as in *Hermetia*.
(5.) Fifth posterior cell only touching discal at its upper corner, instead of being broadly joined with it. The anal, on the other hand, agrees better with *N.*

uliginosus, being very broad. · *Nemotelus nigrinus* is even less like the fossil than *N. uliginosus*.

Hab.— Miocene shales of Florissant, 1909 (*George Sternberg*). Am. Mus. Nat. Hist., No. 10181.

By comparison with other genera, it becomes evident that *Hermetia* has a more primitive or less modified venation than *Nemotelus;* hence *N. prisculus* may be regarded as a primitive member of its genus. The living genus is a large one, and it may be that some of its species have characters approaching those of the fossil. *Nemotelus canadensis* Lw. occurs in Colorado to-day. In New Mexico I have taken *N. canadensis* Lw. at Albuquerque, and *N. unicolor* Lw. at Las Vegas.

N. prisculus is the first Stratiomyid to be described from the Florissant shales. It has no resemblance to the Green River (Eocene) species described by Scudder. Meunier has described a genus *Hermetiella* from Baltic Amber, but it is not at all like either *Hermetia* or the fossil now described. Except for the antennæ, Meunier's genus appears to resemble the Beridinæ.

BOMBYLIIDÆ.

Pachysystropus condemnatus sp. nov.

Abdomen dark colored, about 10 mm. long, 3 wide, minutely hairy, the hair at apices of last two segments quite long; dorsal sclerites of all the segments except the two last produced anterolaterally into rounded lobes, which are very prominent on the anterior segments, and become less so posteriorly, the result being that the sides of the abdomen, seen from above, appear coarsely obtusely serrate (in *P. rohweri* the lateral anterior corners of the first three segments project); hind femora stout and hairy; wing about 8½ mm. long, hyaline, nervures ferruginous; venation similar to that of *P. rohweri*, except that the upper branch of the third vein is strongly elbowed, without showing any sign of a cross-vein to second, while the anal cell is closed about 120 μ from the margin, and the first posterior about the same distance. The anterior cross-vein is 935 μ from apex and 1410 from base of discal cell. The rock is broken so that the head and thorax are lost.

Hab.— Miocene shales of Florissant, Colorado (*Univ. of Colo. Exped.*).

In Verrall's arrangement this falls in the Toxopharinæ rather than the Systropinæ, on account of the hair on the abdomen. In Williston's table the genus runs to *Dolichomyia*, from which it is quite distinct. In having a closed anal cell and only three posteriors it agrees with *Toxophora*, but it is otherwise different, having a closed first posterior and only two submarginals.

It will be useful to give a key for the separation of the Florissant Bombyliid genera.

First posterior cell closed; only three posterior cells . . *Pachysystropus.*
First posterior cell open . . . . . 1.
1. Three posterior cells; two submarginals . . . . . *Melanderella.*
Four posterior cells . . . . . 2.
2. End of second vein its most apicad point; two submarginals . *Lithocosmus.*
End of second vein not its most apicad point, the vein bending over apically, so that its outer angle with wing-margin is less than a right angle . . . 3.
3. Upper branch of third vein elbowed, without any projecting stump *Megacosmus.*
Upper branch of third vein angled, with a projecting stump . *Alepidophora.*

For a tabular statement of the differences between the last two, see Bull. Amer. Mus. Nat. Hist., XXVI, p. 10.

CRUSTACEA.

OSTRACODA.

Cypris florissantensis sp. nov.

Shell about 850 μ long and 510 deep, or sometimes rather larger; surface minutely granular; shape nearly as in *C. virens*. Similar to the European Miocene species *C. faba* Desm., but not so long in proportion to its depth. (I have seen Œningen material of *C. faba* in the museum at Constance.)

Hab.— Miocene shales of Florissant, very common. Now described from specimens on the type case of *Indusia cypridis*. Am. Mus. Nat. Hist., No. 10190.

This is the only Crustacean known from Florissant. I have had it for a number of years, but did not publish it because I had sent specimens to Mr. R. W. Sharpe, and hoped that he would prepare an account of it.