SOME AMERICAN FOSSIL INSECTS.

By T. D. A. Cockerell,

Of the University of Colorado, Boulder.

The insects described in this paper range in age from the Coal Measures to the Miocene. Perhaps the most interesting is a new species of *Dolophilus*, the first insect to be described from American amber. Second in interest is *Hypoderma ascarides* (Scudder), represented by larvae and pupae, which are sufficiently numerous and well preserved to leave no doubt that they belong to the Oestridae, and were parasitic on some mammal. Two Coleopterous elytra represent a new Eocene locality for fossil insects in North Park, Colorado. A gall on narrow-leafed cottonwood from Florissant appears to have been made by a beetle of the genus *Saperda*.

The majority of the Florissant insects described were received through Mr. F. H. Ward, of Rochester, New York, who obtained them from Mr. G. W. Wilson of Florissant, whose ranch had previously yielded many new species of fossils. It is a pleasure to record a new genus from the Mazon Creek Carboniferous, collected by Mr. L. E. Daniels, who has done so much to increase our knowledge of the Carboniferous land fauna. The insects not indicated as being in the National Museum and in the museum of the University of Colorado.

DIPTERA.

PLECIA WOODRUFFI, new species (Bibionidae).

Wing 7 mm. long, 2.75 broad. Costal region suffusedly dusky. A relatively broad-winged species of ordinary type, somewhat remarkable because the anterior cross vein is shorter than the distance from its lower end to the basal corner of the second posterior cell. Second posterior cell on upper side about 2.8 mm. long; submarginal cell about 1.9 mm. long; outer side of anal cell not much elbowed.

Green River Eocene, east side of Evacuation Creek, near Ute Station, Utah (E. G. Woodruff). The species is represented by a single wing, on the underside of a rather thick slab of shale on which are many larvae of *Hypoderma ascarides*. This species is smaller than

P. dejecta Scudder, from Green River, Wyoming, and differs in details of the venation. It appears to be quite distinct from the other species described by Scudder, and from the many Canadian forms described by Handlirsch.

Holotype.—Cat. No. 61455, U.S.N.M.

PSILOCEPHALA SCUDDERI Cockerell (Therevidae).

Plate 2, fig. 5.

A figure is given of a specimen collected by Mr. George N. Rohwer at Station 14, in the Miocene shales at Florissant, Colorado. The following description was made from this specimen: Length about 11.5 mm., of which 7.75 mm. is abdomen; black, the abdominal sutures broadly colorless; legs entirely dark; face not hairy; basal joint of antennae with large bristles at end, as in modern *Psilocephala;* wings very short, about 6.5 mm. long, dusky, the apical region paler. The following wing measurements are in microns: Submarginal cell on margin, 1,310; length of second submarginal cell, 2,240; first basal cell on submarginal, 1,250; submarginal on first posterior, 1,216; first posterior on discal cell, 1,184; first posterior on wing-margin, 592; second posterior on discal, 208, and on wing-margin, 560; third posterior on discal, 368; width of anal at broadest part, 560. This specimen is in United States National Museum. Cat. No. 61456.

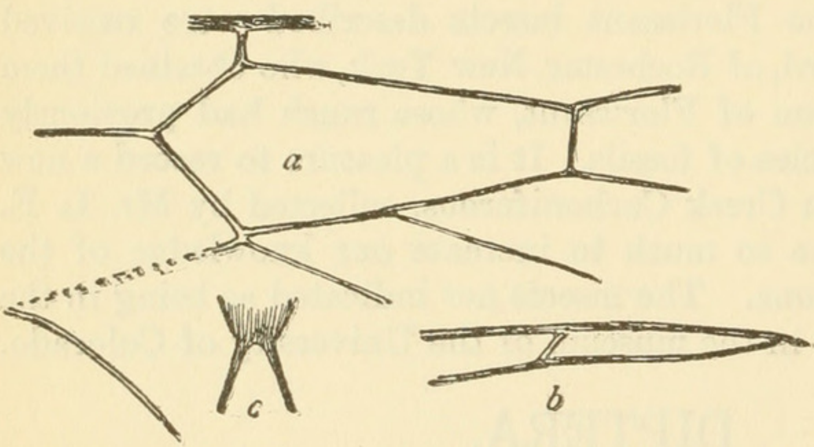

Fig. 1.—Oxycera rohweri. *a*, Discal cell and adjacent parts. *b*, Second submarginal cell. *c*, Scutellar spines.

OXYCERA ROHWERI, new species (Stratiomyidae).

Length probably about 8 mm.; black, the abdomen extremely broad, about 4 mm. wide, without light markings, its dorsal surface with very fine and short rather close dark hair; wings about 6.25 mm. long, width near base about 2.35 mm., fuliginous, the stigmatic spot small. Cubital vein forked, the second submarginal cell long; discal cell very long; veins from discal cell reaching wing margin; anal cell very broad, closed. Scutellar spines long, close together.

The following measurements are in microns: Length of second submarginal cell, 608; discal cell on first basal, 224, on second basal, 256, on first posterior, 752; width of anal cell about middle, 720; end of anal cell to wing-margin, 336; second posterior cell on wing-margin, 560; third posterior cell on wing-margin, 640; fourth posterior cell on wing-margin, 960; fifth posterior cell on wing-margin, 1,120.

Miocene shales of Florissant, Colorado, Station 14 (George N. Rohwer). The abdomen is like that of *Pachygaster maculicornis* Hine (determined by Malloch), which I collected on the campus of the University of Colorado, Boulder, on June 30. The venation differs from *Pachygaster*, and agrees better with that of *Oxycera*, of the section having the cubital vein forked. The insect is peculiar for the very long discal cell, and the veins leaving it dark and distinct to the wing-margin; in these respects it is more primitive than the living species of *Oxycera* of which I have any knowledge.

HYPODERMA ASCARIDES (Scudder).

Plate 2, figs. 4, 6, 7.

Musca ascarides Scudder, Tertiary Insects of North America, 1890, p. 551.

Larva large and robust, fully 30 mm. long and 8 broad, formed as in the modern *H. lineata*, each segment with a transverse row of tubercles beset by minute bristles, the lateral tubercules inclined to be prominent, as in *H. bovis.* Pupa about 11 mm. long and 6 broad, very dark, with strong lateral spinuliferous tubercles marking the segments. The details are best shown by the figures; *a*, caudal end of larva, with spiracles and tracheal tubes; *b*, three segments of middle of larva, showing spinuliferous areas; *c*, lateral projecting spinuliferous area of a larva beginning to contract; *d*, spinuliferous areas of another larva; *e*, mandibles of larva; *f*, lateral spinuliferous projections of semipupa; *g*, contracted and hardened pupa.

Green River Eocene, east side of Evacuation Creek, near Ute Station, Uintah Railway, eastern Utah (E. G. Woodruff).

Plesiotypes.—Cat. No. 61457, U.S.N.M.

The specimens are very numerous, in all stages between the freshly dropped larva and the hardened pupa. Considering their age, they probably represent an extinct genus of Oestridae, which appears to differ from *Hypoderma* by the prominent lateral tubercles of the pupa, more after the manner of *Cephalomyia.* In the absence of the adult fly, however, it seems undesirable to remove the species from *Hypoderma.*

Scudder[1] remarks that the specimens of *Musca ascarides* " so closely resembles the larvae of bot flies that I could scarcely persuade myself that they did not belong to the Oestridae. The appendages of the skin, however, are much more delicate than is usual in Oestridae, and are uniformly distributed over the surface or are altogether absent." The more complete material now before me shows that the spinules or minute bristles are not uniformly distributed over the skin, but are

[1] Tertiary Insects of North America, 1890, p. 551.

arranged in patches as in the Oestridae. In some specimens, owing to the two surfaces being preserved on a single plane, the surface appears to be more completely covered than it actually was in life. The structures are not more delicate than in some Oestridae. Scudder also remarks that it is difficult to understand how such masses of Oestrid larvae could accumulate at one place. This, however, is quite possible if they infested gregarious animals, though we must agree that the infestation seems to have been remarkably heavy.

Scudder's species came from the Chagrin Valley, White River, Colorado. This locality is certainly Eocene, but perhaps not contemporaneous with the Green River beds of Wyoming. The present material is assigned to the Green River, following the indication of the label. Since the above was written a large quantity of material containing *H. ascarides* has come to hand, collected at Hay Gulch, Colorado (D. E. Winchester and others, U. S. Geological Survey). The precise locality is southeast quarter of section 36, township 1 N., range 96 W.

EMPIS PERDITA, new species (Empididæ).

Length 7.5 mm.; wing almost 7 mm. long, the apical and costo-apical region faintly dusky; structure quite normal for the genus. Hind femora 3 mm. long, not incressate, thinly clothed with black bristles, but with a longitudinal bare band; anterior femora 2 mm. long.

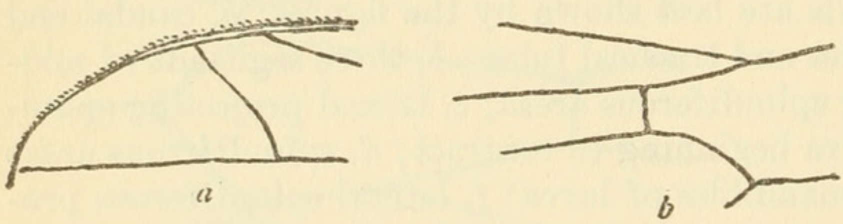

FIG. 2.—EMPIS PERDITA. *a*, END OF THIRD VEIN. *b*, END OF FIRST BASAL CELL.

The following measurements are in microns: Height of head, about 990; length of proboscis, about 1680; length of antennae (excluding style), about 640. Venation essentially as in *Empis trigramma*, the nervure separating the first basal cell from discal strongly arched, longer than the anterior cross-vein. Measurements in microns: End of second vein from end of upper branch of third, 225; first basal cell on first submarginal, 320; discal on second posterior, 176; discal on third posterior, 512; discal on second basal, 288; lower side of second basal beyond tip of anal, 384.

Miocene shales of Florissant, Colorado; received from Mr. L. E. Daniels, who obtained it from Mr. J. C. Carr. Easily known from the previously described species of *Empis* from Florissant by its much larger size.

In the original account of *Empis florissantana* Cockerell[1] the figure of the discal cell is upside down.

[1] Proc. Acad. Nat. Sci. Phila., 1914, p. 646.

PROTOLOMATIA RECURRENS, new species (Bombyliidæ).

Length, about 10 mm.; wing, 6.2 mm.; head, thorax, dorsal surface, and apical part of abdomen black or dark brown, the abdomen colorless at the sutures; wings hyaline; legs pale reddish. Thorax dorsally bare; antennae moderately long, proboscis much shorter than (vertical) length of head. Anterior cross-vein slightly oblique, not at all approximately in a straight line with lower branch of fourth vein, as it is in *Lomatia lateralis*. Second vein strongly recurved at end, in the manner of *Alepidophora pealei*, but second and third posterior cells essentially parallel-sided, wholly unlike those of *Alepidophora;* anterior cross-vein considerably beyond middle of discal cell; four posterior cells, all open, but first contracted apically; anal cell open; second submarginal cell squarely truncate at base, with an appendicular nervure directed basad from the corner.

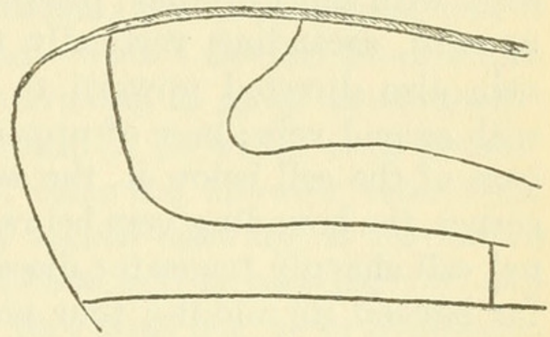

FIG. 3.—PROTOLOMATIA RECURRENS. APEX OF WING.

The following measurements are in microns:

First submarginal cell on wing-margin	784
First posterior cell on wing-margin	160
Second posterior on wing-margin	800
Third posterior on wing-margin	800
Fourth posterior on wing-margin	1,280
Anal cell on wing-margin	160
Praefurca	496
First basal cell on first submarginal	1,440
First posterior on first submarginal	976
First posterior on second submarginal	1,456
Discal on second basal	128
Discal on first basal	1,200
Discal on first posterior	752
Discal on fourth posterior	912
Second basal on fourth posterior	160

The discal cell is long, and its outer margin shows a very strong double curve.

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61990, U.S.N.M.

Differs from the type of the genus by having the second vein recurrent, as in *Alepidophora*, and also in many lesser details. It runs in my key to *Alepidophora*.[1]

[1] Bull. Amer. Mus. Nat. Hist., vol. 23, pp. 229–235.

PROTEPACMUS, new genus (Bombyliidae).

Allied to *Alepidophora*, but wings much longer and with three submarginal cells; abdomen elongated but rather broad, the sides with rather long, pale reddish stiff hairs. Face prominent; antennae apparently ordinary; proboscis not elongated; hind femora not hairy, but with a row of stout bristles; hind tibiae without hairs or bristles on inner side, but with stout bristles (about 480 microns apart); costa with short bristles; præfurca short; end of second vein directed upward, ascending vertically to the costa; upper branch of third vein also directed upward to the costa, its terminal part parallel with second vein; base of upper apical submarginal cell for basad of base of the cell below it, the second vein very slightly bent at basal corner, the bounding vein below weak; base of lower apical submarginal cell sharply truncate; discal cell very long, the discal cross-vein far beyond its middle; four posterior cells, all open on margin, the second extremely widely open; anal cell narrowly open at end.

In my key[1] this runs to 34. It is certainly close to *Cyllenia*, agreeing in most details of the venation, but the shape of the second posterior cell is quite unlike that of *Cyllenia* or *Tomomyza*. There is also evident affinity with the Californian *Exepacmus*, but that is a more hairy insect, and the venation differs in detail.

PROTEPACMUS SETOSUS, new species.

Length 10.5 mm.; wings a little over 8 mm., hyaline, veins pale ferruginous; head and thorax dark brown (probably black in life); abdomen somewhat paler, the sutures not conspicuously pallid; abdomen elongated, but rather broad, its length 7 mm., width near base 3.5 mm. The discal cross-vein is only slightly oblique. The following measurements are in microns:

Width of upper apical submarginal cell near end	320.	
First posterior cell on first submarginal	1120.	
First posterior on lower apical submarginal	1376.	
First posterior on wing-margin	224.	
First posterior on second discal	720	(Same in *Alepidophora pealei*).
First posterior on second posterior	1632.	
Discal cell on first basal	2320	(1872 in *Alepidophora pealei*).
Discal on second basal	480.	
Discal on second posterior	320.	
Second posterior on wing-margin	1520.	
Second posterior on third posterior	800.	
Third posterior on wing-margin	608.	
Fourth posterior on second basal	208.	
Anal cell on fourth posterior	1600.	
Anal on wing-margin	208.	

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61991, U.S.N.M.

[1] Bull. Amer. Mus. Nat. Hist., vol. 33.

PACHYSOMITES, new genus (Ortalididae).

A genus of the subfamily Richardiinae, running in Williston's tables[1] exactly to *Epiplatea*, but the shape of the discal cell is entirely different, its apical margin being long and very oblique, undulating and forming a gentle double curve, an exaggeration of the condition found in *Oedopa;* in addition, the first vein extends far toward the end of the wing, reaching the costa at an extremely acute angle, in the manner of the Syrphid genus *Chilosia;* the submarginal cell is constricted in the subapical region, but expands toward the margin, as in *Richardia*, except that the constriction is more pronounced; the first posterior cell is very broad apically, its width even greater than length of oblique end of discal cell; the anterior cross-vein, which is somewhat oblique and gently arched outward, is far before the middle of discal cell. The second basal cell is very narrow, and the anal is retracted, its lower angle a very wide one, as in *Richardia.* Robust; femora unarmed and not incrassate; wings with no conspicuous markings; ovipositor short.

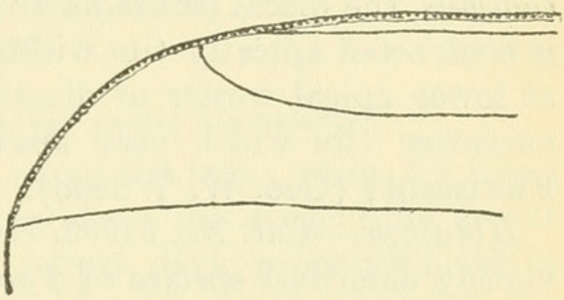

FIG 4.—PACHYSOMITES INERMIS. APEX OF WING.

PACHYSOMITES INERMIS, new species.

Length 8.3 mm.; very robust; thorax black; dorsally bare; legs dark brown, unarmed, femora not incrassate; abdomen thick, about 3.8 mm. long, dark reddish, with an appearance of longitudinal banding which seems to be due only to the condition of preservation; ovipositor short and thick, about 1 mm. long. Wings about 5.5 mm. long, hyaline, without bands or spots, except a dark cloud above end of first vein, such as occurs in *Euxesta* and *Pseudeuxesta.* The following measurements are in microns:

Marginal cell on costa, about	1040
(It is impossible to be exact, as the first vein grades gradually into costa at end.)	
Submarginal cell on wing-margin, not allowing for curve	770
(The costa is thickened and minutely bristly, the thickened part extending as far as end of third vein.)	
Diameter of submarginal in middle of constriction	288
Diameter of submarginal cell where expanded, basad of constriction	464
Submarginal cell on first basal	1056
Length of anterior cross-vein	352
First posterior cell on wing-margin, not allowing for curve	1280
Fourth vein beyond discal cell, about	720
Oblique apical side of discal cell	1120
Discal cell on first posterior	1712

[1] N. Amer. Diptera, third edition.

Discal cell on first basal	656
Discal cell on second basal	50
Oblique apical side of anal	240

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61992, U.S.N.M.

TABANUS MERYCHIPPI, new species (Tabanidae).

Length 13 mm., abdomen 5.5 mm. broad; anterior wing 10 mm. long. Size and appearance of *T. lasiophthalmus* Macquart. (from Garrison, New York), but eyes not hairy; apical (small-jointed) portion of antennæ more conical, broadened basally instead of cylindrical; distance between eyes a little less (about 0.8 mm. instead of 1 mm.). Spots on wings placed exactly as in *lasiophthalmus* (with the addition of slight dusky suffusion at ends of second and upper branch of third veins), and the abdomen also has a rather obscure dark median band. Comparing the venation with that of *lasiophthalmus*, the discal cell is narrower basally, the fourth posterior cell is contracted apically (its width at margin of wing 384 microns, but at lower apical corner of discal cell 640), and first posterior cell is narrower (its width near apex 480 microns). Miocene shales of Florissant; (Geo. W. Wilson).

Holotype.—Cat. No. 61993, U.S.N.M. Easily known from the previously described species of *Tabanus* from Florissant by the smaller size and spotted wings.

CHILOSIA SEPULTULA, new species (Syrphidae).

Length about 8.5 mm., width of thorax about 3.5 mm.; wings 8 mm. long. Head and thorax dark; abdomen pale, thinly hairy, with black or very dark narrow sutural bands; no longitudinal band. Costa thick, with two rows of minute bristles, as in *C. miocenica*. Apical angle of first posterior cell more acute than in *C. miocenica*.

The following measurements are in microns; the corresponding measurements of *C. miocenica* are given within parentheses:

Width (depth) of marginal cell 800 from end	352	(272)
Length of first posterior cell from lower basal corner to upper apical corner	4,000	(4,080)
Submarginal cell on first basal (not allowing for curve)	1,200	(1,280)
First basal on second posterior	830	(1,090)
Second basal on second posterior	270	(320)
Second basal on third posterior	304	(256)

Holotype.—Cat. No. 61994, U.S.N.M.

The type is from the Miocene shales of Florissant (Geo. W. Wilson).

The smaller specimen, assigned to *C. miocenica*[1] and collected by Mr. Rohwer, belongs to this species.

[1] Bull. Amer. Mus. Nat. Hist., vol. 26, 1909, p. 72.

SCIARA FLORISSANTENSIS, new species (Mycetophilidae).

Male.—Length 4.5 mm., wing 3.6 mm.; veins not setose, venation much like that of *S. abdita* Johannsen, with a long R_1; dark brown, legs dark, wings hyaline; first two antennal joints short and broad, the following ones cylindrical, longer than broad, the third and fourth each about 96 microns long and 76 broad; claspers formed about as in *S. cucumeris* Johannsen, the apical part slender. The following measurements are in microns:

Radius before branching	1,280
R_1 beyond branching (apparent cross-vein)	960
Distance on margin between ends of branches of radius, about	1,250
Lower branch of radius beyond cross-vein	2,080
R-M cross-vein	384
Media before R-M cross-vein	960

The delicate fork of media is wholly obliterated, but the subcosta is distinct and well developed, though colorless.

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61995, U.S.N.M.

CORDYLURA (s. lat.) EXHUMATA, new species (Cordyluridae).

Length, about 6.5 mm.; abdomen, about 2.8 mm.; wing, 6.7 mm.; hind tarsus, about 2.5 mm.; hind tibia about the same; hind femur a trifle longer. Thorax, 3 mm. long, robust, dark, probably black in life; abdomen and legs paler; abdomen short, formed as usual in the family; wings dusky hyaline, not spotted, veins partly dark. Antennal arista long-plumose; auxiliary vein present, but very delicate; none of the veins bristly; costa with a row of minute dark spinules, not longer than diameter of costal vein (this row is single and is not accompanied by delicate bristles, as it is in *Scatophaga*); venation normal for the family; first vein ending about 2.5 mm. from base and 4.2 mm. from apex of wing; end of discal cell about 4.6 mm. from base of wing; first posterior cell about 0.8 mm. wide (deep). Legs minutely hairy, without any long spines or bristles; femora with dark spinules beneath, only at all large or conspicuous toward apex; tibiae spined at apex; tarsi with dark spinules beneath. Discal cell on first posterior, 2,000 microns.

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61996, U.S.N.M.

The insect has the appearance of a *Scatophaga*, but lacks the strong armature of the legs seen in that genus. It is not a *Cordylura*, as that genus is now restricted, but it is impossible to see all the characters used to separate the genera in this family, so I do not attempt to refer it to any genus of Becker's classification.

Heer has described a *Cordylura vetusta* from the Miocene of Croatia, but, judging from his figure, it does not belong to the Cordyluridae.

CHIRONOMUS SCUDDERIELLUS, new species (Chironomidae).

Male.—Length, 6.7 mm.; head and thorax dark, legs ferruginous, abdomen pale; antennae long-plumose, as usual in the genus; wings obliterated (as in all Florissant Chironomidae); genitalia as usual in the genus, the claspers stout. The following measurements are in microns: Distance between eyes, about 320; width of abdomen near base, 880; length of anterior femur, about 1,440; and its tibia the same.

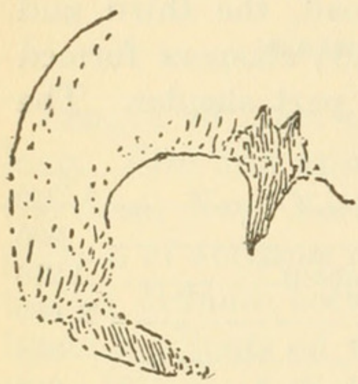

FIG. 5.—CHIRONOMUS SCUDDERIELLUS. GENITALIA.

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61997, U.S.N.M.

Scudder long ago noted the presence of Chironomidae in the Florissant shales, but the specimens have been too poorly preserved to describe. The present specimen has all the characters of genuine *Chironomus*, and, as the genitalia can be figured, it may deserve a name.

LEPIDOPTERA.

TORTRIX (?) DESTRUCTUS, new species (Tortricidae).

Length, about 8.3 mm.; thorax robust, abdomen tapering; antennae reddish, immaculate, about 4.5 mm. long, slender, the apical part curled to form the greater part of a circle; legs hairy or scaly; anterior wings about 8.3 mm. long, outer margin about 3.5 mm., lower margin about 7.3 mm., costal border little convex, apical corner obtuse (apex not at all falcate), outer margin forming only a little less than a right angle with costa and nearly straight; anterior wings apparently more or less longitudinally streaked and with a broad but rather obscure submarginal band, failing or diffused in the costoapical region.

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61998, U.S.N.M.

Much smaller than *T. florissantana* Cockerell. The generic reference is, of course, uncertain.

TRICHOPTERA.

DOLOPHILUS (?) PRAEMISSUS, new species.

Anterior wing about 5.6 mm. long, a little over 2 mm. wide; thinly hairy; apical portion subcuneate, but apex blunt. Thorax about 2 mm. long. Part of a long antenna, and a leg showing a large spur of the usual type, can be seen. All five apical forks present in anterior wing; discoidal cell long-cuneate, closed at apex; no darkened pterostigma, but a cross vein between R_1 and subcosta; anal cell obtuse at end, scarcely or not open. The following measurements are in microns:

Cross vein connecting R_1 with Sc. basad of (vertical) level of base of first fork	400
Base of discal cell to base of first apical fork (separation of R_2 from R_3)	960
R_3 from its separation from R_2 to end	1,760
R_4 from its separation from R_5 to end	2,208
Base of second apical fork basad of level of base of third fork	560
Base of fourth apical fork basad of level of base of third fork	400
M_1 from its separation from M_2 to end	1,840
M_3 from its separation from M_4 to end	1,760
Base of fourth apical fork apicad of level of base of fifth fork	1,120
Cu_1 from its separation from Cu_2 to end	2,320
End of anal cell apicad of level of base of fifth fork	480

In amber from the Eutau formation (Upper Cretaceous; Emscherien), Coffee Bluff, Hardin County, Tennessee (Bruce Wade). The specimen was very kindly forwarded by Prof. Edward W. Berry. It is of extraordinary interest, as being the first insect to be described from American amber. If any considerable insect fauna can be found in Cretaceous amber, it will undoubtedly throw much light on many obscure problems connected with the origin of the modern families and genera. *Dolophilus* McLachlan (Philopotamidae) has four species in Prussian amber, of Oligocene age. The present insect is too close to such forms as *D. aequalis* Hagen to be generically separated, so far as the visible characters show. Ulmer remarks that as regards venation *Dolophilus* is extremely like *Phylocentropus* (Polycentropidae), and I was indeed in doubt whether to refer the present species to the latter genus. The discoidal cell in *Phylocentropus* is shorter, and on the whole our species seems rather to belong with *Dolophilus*. According to Ulmer's phylogenetic scheme, the Philopotamidae are more primitive than the Polycentropidae. It is also noteworthy that of the four living species of *Dolovhilus* three are European and one is Australian.

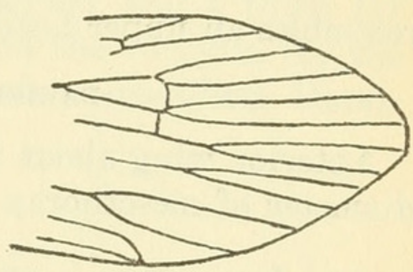

Fig. 6.—Dolophilus praemissus. Anterior wing.

Thus we may say that our Cretaceous fossil is of a very modern type, but it would be more correct to put the matter another way and say that the living *Dolophilus* is a remnant of a very ancient group. It is, in fact, closely related to the Necrotauliidae of the European Lias.

Type.—Cat. No. 62001, U.S.N.M.

PROTORTHOPTERA.

DANIELSIELLA, new genus.

Body essentially as in *Spaniodera*, the mesothorax large, with a considerable portion anterior to insertion of wings; prothorax elongated, though not excessively so; abdomen long; hind legs not fitted for jumping, the femur and tibia like those of *Ischnoneura*. Wings shaped as in *Spaniodera;* subcosta not obscured; radius simple, its apical part hardly separated from costal margin; radial sector very stout, arising far toward base of wing, having two oblique branches above near end, and four branches below, the fourth curved; media with three very oblique branches below; cubitus and anals not observed. The above refers to the anterior wing; the radial sector of posterior wing has three branches below, but the last is nearly in a line with the stem, so that the continuation of the latter rather resembles an upper branch.

DANIELSIELLA PRISCULA, new species.

Anterior wing about 24 mm. long, of which 20 mm. is preserved; diameter of mesothorax slightly over 4 mm.; diameter of prothorax near middle about 2.25 mm. Body and legs are preserved intense black, the middle of the thorax apparently paler, with a black band across mesothorax; wings disky, the radial sector blackened and conspicuous on both wings, the other veins pallid. Mazon Creek, Illinois, in a nodule of Carboniferous (Pennsylvania) age. (L. E. Daniels.)

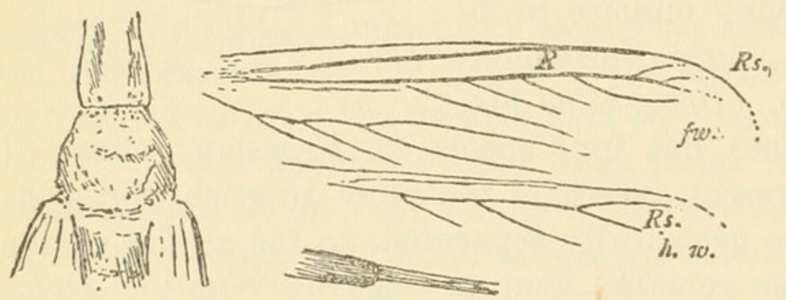

FIG. 7.—DANIELSIELLA PRISCULA. *fw*, FRONT WING. *hw*, HIND WING. *R*, RADIUS. *Rs*, RADIAL SECTOR.

Holotype.—Cat. No. 62000, U.S.N.M.

The interpretation of the venation has been difficult, and may possibly be erroneous. The media is almost exactly like the cubitus of *Dieconeura mazona*, as figured by Handlirsch. Below the stem of the radial sector it is possible to detect a very faint line, shown in the figure, which could conceivably represent a more or less rudimentary media, essentially as in *Gyrophlebia longicollis* Handlirsch. The character of the radial sector, with two very distinct branches above, appears to exclude the insect from *Dieconeura* and *Gyrophlebia*. On the other hand, both radial sector and media present a good deal of resemblance to those of *Ischnoneura oustaleti* Brongniart, from the Carboniferous of Commentry; and a mere simplification of this type gives us the Permian *Liomopterum* and *Lepium* of

Sellards. The distinction between the Spanioderidae, Geraridae, and Ischnoneuridae becomes more difficult with the discovery of additional types. The Spanioderidae have few branches to the radial sector, and many to the cubitus; in the Geraridae the radial sector has many branches, and the cubitus is more or less reduced. *Ischnoneura* has four branches to the radial sector, and four (five?) to the cubitus; it thus falls between the other two families. The general structure of the body and legs seems to be about the same in all. *Danielsiella* may be referred to the Geraridae, but perhaps the correct solution would be to recognize a single family Geraridae (Gerarina Scudder, Geraridae Handlirsch), with subfamilies Gerarinae, Spanioderinae (Spanioderidae Handlirsch) and Ischnoneurinae (Ischnoneuridae Handlirsch).

It may be convenient to adopt a formula for the venation. The number of primary branches may be expressed by a figure, and if these again branch a second figure may be added, and a third for tertiary branchlets. According to this method the formula for the radial sector, media and cubitus of *Spaniodera ambulans* Handlirsch will be:

Anterior wing. Rs. 3. 1. M. 3. 1. Cu. 5.

Hind wing. Rs. 2. M. 1. Cu. 5.

If necessary, distinction can be made between upper and lower branches, by using the form of a fraction; thus *Danielsiella* has Rs. $\frac{2}{4}$, M. 3. It is not always easy to distinguish the main stem from an upper branch (though in *Danielsiella* there is no doubt), and the anterior wing of *Spaniodera ambulans* should perhaps be interpreted as having Rs. 2. 1. 1.

ODONATA.

LITHRAGION (?) OPTIMUM, new species.

Length, about 51 mm., the thorax about 9 mm.; thorax and abdomen with black markings; mesepisternal plates with a broad black band covering most of the surface and a narrow band along inferior margin, with a narrow pale stripe, curved mesad posteriorly, between the two dark portions; mesepimeron with a broad black band, invaded below near the anterior end by an oblique pale stripe; abdominal segments in lateral view showing a pair of stripes, one dorsal and one subdorsal, failing anteriorly on the middle segments, but the subdorsal stripes shorter, with the anterior end pointed; ventral side of abdomen dusky; legs slender, hind femora about 7 mm. long; tibiae very slender, with the usual bristles, hind tibiae 6 mm. long; wings 36 mm. long and about 7.5 wide, dusky, the apical margin suffusedly darker; nodus 11.5 mm. from base of wing; two antenodal cross-veins, in the usual position; quadrilateral with upper side much longer than apical side; several double cells beyond stigma. Miocene shales of Florissant; from the collection of Mr. L. E. Daniels. It formerly belonged to Mr. J. C. Carr, who does not recollect who collected it. The specimen has unfortunately been broken, probably at the time of its discovery, and the stigma and

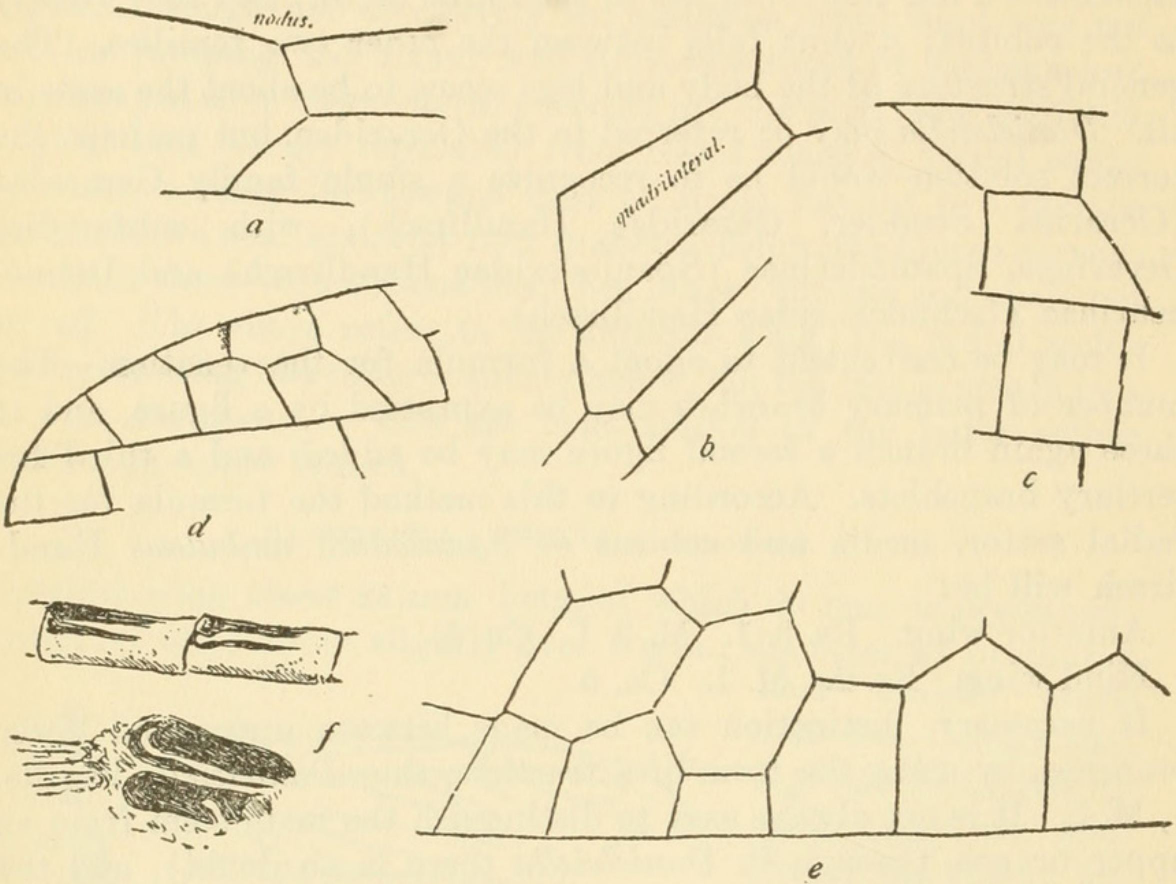

FIG. 8.—LITHAGRION OPTIMUM. *a, b,* DETAILS OF VENATION. *c, d,* CELLS OF REGION JUST BEYOND STIGMA. *e,* CELLS OF LOWER MARGIN OF WING. *f,* THORAX AND MIDDLE ABDOMINAL SEGMENTS.

middle region of the wing is missing. What is left agrees with *Lithagrion;* the species will be readily known by the large size and dusky (though translucent) wings.

HYMENOPTERA.

AULACITES, new genus (Evaniidæ).

A genus of Aulacinæ, related to *Aulacus*, but with the first recurrent nervure joining the second submarginal cell; only two well-defined submarginal cells, the second transversocubital being evanescent, though leaving traces showing where it should be. Anterior part of thorax transversely striate.

Type.—Aulacites secundus, new species.

AULACITES SECUNDUS, new species.

Head and thorax black, wings clear. Thorax 5.5 mm. long; anterior wing 9.5 mm. long (that of *A. bradleyi* 11 mm.). Close to *Aulacites bradleyi* (*Aulacus bradleyi* Brues), but on comparison with the type of that species apparently distinct, the thorax being much more strongly transversely grooved, the first discoidal cell longer in proportion to its height, and various other details of the venation different. The following comparative measurements in microns will bring out the differences (s.=*secundus;* b.=*bradleyi*): First submarginal cell on basal nervure, s. 720, b. 672; first s. m. on marginal, s. 480, b. 576; first s. m. on second s. m., s. 1152, b. 1280; first discoidal cell on basal nervure, s. 480, b. 608; first discoidal on third discoidal, s. 720, b. 800; apical side of third discoidal, s. 720, b. 736.

Miocene shales of Florissant, station 14 (University of Colorado Expedition).

Holotype.—Cat. No. 61458, U.S.N.M.

I have been a little in doubt whether to consider this a distinct species or only a variety, but it seems to be sufficiently distinct. The

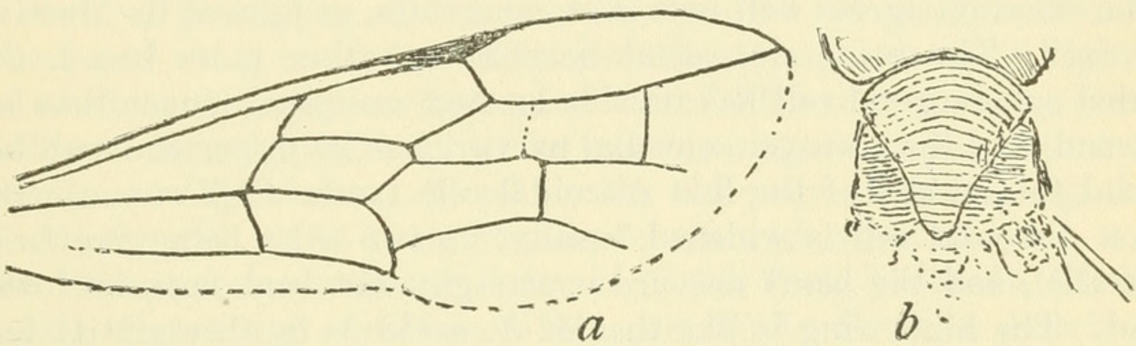

FIG. 9.—AULACITES SECUNDUS. *a*, ANTERIOR WING. *b*, ANTERIOR PART OF THORAX.

remoteness of the basal nervure from the stigma suggests affinity with *Pristaulacus* and *Interaulacus*. rather than with *Aulacinus*. The claws can not be seen.

HEMICHROA EOPHILA, Cockerell (Tenthredinidae).

A new specimen is 10 mm. long; anterior wing 7.3 mm.; width of thorax very little over 2 mm. The following measurements of the anterior wing, in microns, show some variation from the original type, but do not appear to indicate a distinct species:

Transverse-costal nervure basad of upper end of basal, about	320
Length of basal nervure (of which 800 is beyond the bend)	960
Length of first submarginal cell	368
Length of (oblique) outer side of third submarginal cell	690
Upper side of third submarginal cell	912
Third submarginal on first marginal	560
Lower side of third submarginal	1,150
Length of second transverso-cubital	336
Upper side of second discoidal	850
Lower end of basal nervure basad of transverso-medial	770
Upper side of third discoidal	880
Third discoidal on first discoidal	592
Third discoidal on second discoidal	480
Lower side of third discoidal	1,250
Outer (apical) side of third discoidal	800
End of second recurrent nervure basad of second transverso-cubital	160

Contracted (linear) part of lanceolate cell	960
End of contracted part of lanceolate cell to lower end of transverso-medial nervure	1,150

Miocene shales of Florissant (Geo. W. Wilson). Should this be separated from the original *H. eophila*, the specimen collected by Wickham at the Wilson Ranch would go with it.

ERIOCAMPOIDES MICRARCHE, new species (Tenthredinidae).

Length, 6.5 mm.; anterior wings, about 5.5 mm.; mesothorax pale, other parts of thorax darker; abdomen pale, with the apical third fuscous, the extreme base also dusky; antennae with all the joints visible, except the two short (basal) ones, the joints measuring as follows in microns: (3.) 432, (4.) 240, (5.) 240, (6.) 208, (7.) 160, (8.) 160, (9.) 192. The last two antennal joints look, at first sight, like a single one; the others are more distinct, as usual in the group. The venation agrees well with *Eriocampoides*, as figured by MacGillivray.[1] The transverse-costal nervure is rather more basad, the third submarginal cell has its side on first marginal longer than on second, and the transverso-medial nervure has its upper end well beyond the middle of the first discoidal cell (as in *Phyllotoma*); the first discoidal cell is widened basally, its two sides being far from parallel, and the basal nervure is straight, not bent near its lower end. The hind wing is like that of *E. aethiops* in all essential features, but the median cell is more produced and very narrow at the apex.

The following measurements of the anterior wing are in microns:

Transverse-costal nervure basad of upper end of basal, about	640
Narrow upper side of first discoidal cell	208
Length of basal nervure	750
Lower end of basal nervure to transverso-medial	750
First discoidal on second submarginal	256
First discoidal on second discoidal	416
Lower side of second discoidal	770
Length of first submarginal cell	320
Apical side of second submarginal cell	208
Third submarginal on first marginal	560
Third submarginal on second marginal	544
Third discoidal on second submarginal	640
Third discoidal on third submarginal	400
Third discoidal on first discoidal	400
Third discoidal on second discoidal	480
Lower side of third discoidal	912
Apical side of third discoidal	592

Miocene shales of Florissant (Geo. W. Wilson).

Holotype.—Cat. No. 61999, U.S.N.M.

Very much smaller than *E. revelatus* Cockerell, already known from Florissant.

[1] Proc. U. S. Nat. Mus., vol. 29, pl. 30, fig. 52.

COLEOPTERA.

SAPERDA LESQUEREUXI, new species (Cerambycidae).

Plate 2, fig. 1.

Gall on small branch of *Populus lesquereuxi* Cockerell, fusiform, about 13 mm. long and 6.5 broad, exactly like the galls of the living *S. moesta* Le Conte.

Miocene shales of Florissant (University of Colorado Expedition).

CALANDRITES HINDSI, new species.

Plate 2, fig. 3.

Elytron 8 mm. long, 2.8 broad; as preserved ferruginous; base truncate; inner basal angle obliquely truncate, apparently indicating a rather large scutellum; inner (lower) margin concave; apex obtuse; 10 rows of punctures, all except those nearest the margin coarse; second and third rows (counting from inner side) meeting eighth and ninth at an angle near apex; fourth and fifth rows close together, joining in the subapical region, but not forming an angle; sixth and seventh rows free below, cut off by the obliquely ascending eighth; second row with about 34 punctures; fourth with about 25.

In Eocene rock, southeast corner of North Park, Colorado (N. E. Hinds), University of Colorado Museum 5799. Scudder described *Calandrites* as follows: "Elytra, which seem from their elongate form and the character of their markings to be not far removed from the much smaller species of the old genus *Calandra*, though it is certainly possible that they may belong in a very different group. They both belong to rather large species, and agree in having 10 punctured striae." The present species is considerably larger than either of Scudder's but by its coarse punctures comes closest to *C. defessus*. The large size readily distinguishes our insect from all other known American Eocene Calandridae.

OPHRYASTITES HENDERSONI, new species.

Plate 2, fig. 2.

Elytron 5.5 mm. long, 2.35 broad; as preserved blackish; convex, outer margin strongly convex; apex angular; nine deep striae, without any distinct punctures. In Eocene rock, southeast corner of North Park, Colorado (N. E. Hinds), University of Colorado Museum 5799. It is given the name of Prof. J. Henderson, curator of the university museum, well known for his writings on Colorado paleontology and zoology. This agrees well with Scudder's blanket genus *Ophryastites*, but is distinguished by the very convex outer margin and the lack of distinct punctures.

The strata furnishing this and the last species are of somewhat uncertain age, but probably either Fort Union or Wasatch. The locality is in Arapahoe (or Muddy) Pass.

EXPLANATION OF PLATE 2.

FIG. 1. Gall of *Saperda lesquereuxi*, new species.

2. *Ophryastites hendersoni*, new species.

3. *Calandrites hindsi*, new species.

4. *Hypoderma ascarides* (Scudder). Larva and pupa. *a*, Caudal end of larva, with spiracles and tracheal tubes; *b*, three segments of middle of larva, showing spinuliferous areas; *c*, lateral projecting spinuliferous area of a larva beginning to contract; *d*, spinuliferous areas of another larva; *e*, mandibles of larva; *f*, lateral spinuliferous projections of semipupa; *g*, contracted and hardened pupa.

5. *Psilocephala scudderi* Cockerell.

6, 7. *Hypoderma ascarides* (Scudder). A single example and a slab with numerous specimens (natural size).