MIOCENE FOSSIL INSECTS.

BY T. D. A. COCKERELL.

The miocene insect beds at Florissant, Colorado, continue to furnish numerous undescribed species, and the time is still distant when it will be appropriate to bring all the data together in a single monograph. To illustrate the wonderful richness of the Florissant shales, it is sufficient to mention Professor H. F. Wickham's collection made in 1912 at the Wilson Ranch. In an excavation about 20 feet long and 6 feet deep he obtained over 90 species of Coleoptera, of which at least 40 were new. In addition to this, Professor Wickham, my wife, and I secured various species of other groups in this same excavation, so that probably there will be in all not less than 60 new species. This particular spot had been looked over several times in previous years by University of Colorado expeditions, but had yielded nothing of particular value, because only the surface was examined. On digging into the hill, the remarkable collection just mentioned was secured. There can be no doubt that the Florissant shales are practically inexhaustible; but it is unfortunately true that many good fossils, some doubtless of species which will never be found again, have been collected and lost or placed where they are unlikely to fall into the hands of competent students. Even in the larger museums there are still many undescribed Florissant species, and it will be some years before we have a complete account of the materials already gathered and in safe custody.

In Europe, the locality which we naturally compare with Florissant is Œningen in Baden. The beds, which I have examined so far as their present condition permits, are not, strictly speaking, at Œningen, but above the village of Wangen, on the Rhine. They are doubtless extensive, and would yield much of value if reëxcavated, but they have been neglected for many years. Various European museums contain Œningen insects, but by far the richest collection is that of Heer at Zürich. Heer estimated that he knew 844 species of fossil insects from Œningen, but only 464 ever received published scientific names. Of these no less than 250 were Coleoptera, but Professor Wickham records 494 described beetles from Florissant. Eighty

Hemiptera are from Œningen, but Florissant has about 230. The Hymenoptera from Œningen number 60, but those of Florissant are about 220, with only one of the many ants as yet published. Thirty Diptera come from Œningen, over 100 from Florissant. Œningen has only one recorded Trichopteron, Florissant 29. The Œningen list could be considerably increased if we added a number of species cited by their generic names or even less exactly, but not described or given specific names. Experience shows that such records are too unreliable to be of much value. Œningen has more species than Florissant in each of the following groups, as the lists stand at present. (O. = Œningen; F. = Florissant.)

ODONATA—Libellulidæ: O. 9, F. none. However, the Œningen species are simply a lot of nymphs; one, *L. perse*, is doubtfully from Œningen. Specimens of *L. eurynome* and *L. doris* are in the University of Colorado Museum.

THYSANOPTERA—Thripidæ: O. 2, F. none.

ORTHOPTERA—Gryllotalpinæ: O. 1, F. none. The Œningen species is stated to be long and narrow, but we have no other details.

COLEOPTERA—Carabidæ: O. 35, F. 33. Dytiscidæ: O. 9, F. 8. Gyrinidæ: O. 2, F. none. Scaphidiidæ: O. 2, F. none. Histeridæ: O. 9, F. none. Elateridæ: O. 10, F. 4 (but many more Florissant species await description). Buprestidæ: O. 31, F. 15. Hydrophilidæ: O. 17, F. 8. Trogositidæ: O. 7, F. 1. Coccinellidæ: O. 7, F. 3. Scarabæidæ: O. 34, F. 28. Florissant especially outranks Œningen in Curculionidæ (O. 24, F. 95) and Staphylinidæ (O. 7, F. 45). The most striking feature is the absence of Histeridæ at Florissant. It is curious that the lists contain no Cicindelidæ.

HYMENOPTERA—Cephidæ: O. 2, F. 1. Sphecidæ: O. 4, F. 2. Œningen has 34 described species of ants, Florissant only one, but very numerous ants from the latter place await description by Dr. Wheeler.

LEPIDOPTERA—Psychidæ: O. 1 (a case), F. none.

DIPTERA—Bibionidæ: O. 14, F. 4. Chinonomidæ: O. 3, F. none good enough to describe. Tachinidæ: O. 1, F. none.

HEMIPTERA—Reduviidæ: O. 11, F. 3. Naucoridæ: O. 2, F. none. Belostomatidæ: O. 2, F. 1. Nepidæ: O. 1, F. none.

This enumeration is of interest mainly as a statement of the present condition of our knowledge, but some of the features indicated probably will be confirmed or amplified by fuller data.

The new species described below have, with few exceptions, been collected by Professor Wickham.

ORTHOPTERA.

Amblycorypha (?) perdita n. sp. (Locustidæ).

Tegmen 30.5 mm. long, 12 mm. broad, the broadest part about 11 mm. from the very broadly rounded and obtuse apex; costal region not enlarged, the subcostal nervure about equally distant from costa and stem of radius until 5 or 6 mm. from base, where it is nearer costa than radius, and so continues; radius straight, the radial sector coming off at a rather wide angle near the middle of the tegmen; apical field irregularly reticulated throughout. The lower margin of the tegmen can be distinctly followed to near the base, and there appears to be no anal lobe, but it seems exceedingly probable that this is illusory, the apparent margin near the base being the sharp line of demarcation found in the modern species, limiting the anal area above.

Amblycorypha (?) perdita.

Miocene shales of Florissant, Wilson Ranch (*Wickham*). I have wondered whether this could be Scudder's *Orchelimum placidum*, but it is certainly not an *Orchelimum*, and beyond a general similarity, there is nothing definite to indicate its identity with Scudder's species. It is provisionally placed in *Amblycorypha*, to which it is presumably allied, and from which, without better preserved materials, it does not seem worth while to separate it. Mr. J. A. G. Rehn kindly examined my sketch of the venation, and reported that it was not quite like any modern genus; as he observed, if the anal area is truly absent, the tegmen is quite peculiar; but if it is present, the insect is not very remarkable. Except for the shape of the tegmen, there is a rather close resemblance in structure to *Pycnophlebia speciosa* (Germar) from the lithographic stone of Solenhofen.

HEMIPTERA.

PSYLLITES n. gen. (Psyllidæ).

The distinctive characters are in the venation, as follows:

(1) The radius leaves the radial sector a little before the middle of the wing, and passes obliquely to the costa, where it ends, as in *Psylla astigmata*.

(2) The stem of the radius is in a straight line with the radial

sector, which is nearly straight, with only a slight curvature, practically as in *Psylla caudata*.

(3) The mediocubital fork is some distance basad of the separation of the radius from its sector, as in *Psylla*.

(4) The separation of the radius from the radial sector is at practically the same level as the separation of the branches of the cubitus, the cell between the cubital branches being long, the arrangement herein practically as in *Pachypsylla venusta*. The cell in the forks of the media is, however, as in *Psylla*.

Except for the shape of the cell in the forks of the cubitus, the insect could go in *Psylla;* herein it is less specialized than *Psylla*. The outline of the wing, as figured, is only approximate.

Psyllites crawfordi n. sp.

Length about 2 mm., anterior wing less than 1.5 mm.; wings clear, without markings. The following measurements are in microns: length of upper wing, about 1,440; radial fork to base of wing, about 690; radial fork to end of radial sector, about 752; medio-cubital fork to branching of cubitus, 224; medio-cubital fork to branching of media, 624; cell between cubital branches on wing-margin, 320; fork of media to level of radial and cubital forks, about 416; fork of media to nearest point on anterior branch of cubitus, 208.

Psyllites crawfordi, wing.

Miocene shales of Florissant, Wilson Ranch (*Wickham*). On the same piece of shale as the type of *Heteromyiella miocenica* and very close to it. Dedicated to Mr. David L. Crawford, whose monograph of the Psyllidæ of the New World has been of great use in the study of the fossil species.

HYMENOPTERA.

PALÆOTELEIA n. gen. (Scelionidæ).

Elongate, with the same form as *Chromoteleia semicyanea* Ashmead, except that the abdomen is broader, fully twice as broad at base, broadest about the end of the second segment, and with the apical 1 mm. or more conspicuously narrower than the part before. Antennæ inserted very close to the middle (vertical) line of face, perhaps on a frontal prominence; scape apparently short; flagellum rather long and of uniform width, not at all moniliform. Head broad,

eyes prominent. Thorax long and narrow, the parts indistinct, but there is a cordiform metathoracic area or depression, and just in front of this a transverse series of little ridges or pleats, presumably on the postscutellum (compare *Macroteleia*). Hind femora unusually stout. Wings with a very well developed submarginal vein, but no marginal at all; stigmal vein short but distinct, ending in a round knob; postmarginal vein long; a shadowy oblique vein going from the postmarginal toward the stigmal knob, as in *Chromoteleia*.

Palæoteleia oxyura n. sp.

Length nearly 7 mm.; anterior wing nearly 4 mm., the stigmatal knob 2.25 from base. Elongate, narrow, black, antennæ and legs ferruginous; thorax narrow, about .75 mm. in length anterior to wings; abdomen narrow and tapering, sessile, rather broad at base, its length a little over 4.5 mm., its width a very little over 1 mm.; thorax same width as abdomen. Wings ample, clear, faintly reddish, with a small ferruginous cloud in stigmatal region.

The following measurements are in microns: length of postmarginal vein, about 640; length of stigmal vein, including knob, 256, without knob, 192; diameter of flagellum, 128; width of hind femur, 352; length of hind tibia, about 1,120.

Miocene shales of Florissant, Wilson Ranch (*Wickham*).

This is fully as specialized as the modern genera.

Polistes kirbyanus n. sp.

Osmia kirbyana Heer MS.

Stout bodied, with rather short abdomen, the basal two segments of which are pallid and the other parts dark brown. Wings ample, dusky. Length of body 13 mm., of wings about 11 mm.; first discoidal cell almost 5.5 mm. long. Most of the venation of the anterior wings can be made out, showing that it is nearly normal for *Polistes*, except that the first t.c., instead of being straight, has a double curve like the second. The third s.m. is much broader above than the second. As in *Polistes*, the b.n. goes basad of t.m.; the second s.m. receives both recurrent nervures (the cell is very broad, broader than in modern *Polistes*); the first discoidal cell is very oblique at end; the marginal cell has an elongated triangular form. The great width of the second s.m. and the long very oblique apical end of the first discoidal agree better with *Monobia* (*M. quadridens* L., Rito de los Frijoles, New Mexico, *W. W. Robbins;* det. Rohwer) than with *Polistes*. On the other hand, the third s.m. agrees with *Polistes*, not with *Monobia*.

Miocene of Wangen, Baden; described from Heer's type specimen in the University Museum at Zürich. Heer named a *Polistes primitiva* from Œningen (Wangen), but as no description appeared, it cannot be recognized.

It may be useful to add that Heer's *Vespa atavina* from Moudon is not the same species as his much earlier *Vespa attavina* from Parschlug; Handlirsch treats them as identical, spelling the name *atavina*.

Odynerus percontuaus n. sp.

Length about 8 mm.; black, including legs; wings hyaline, the nervures pallid, darker basally; length of anterior wing about 5 mm., reaching at least to end of third abdominal segment; head and thorax strongly but irregularly punctured; abdomen very broad at base, second segment large, about 1.65 mm. long and 2.40 broad; apex of stigma broad and obtuse, only moderately oblique; end of marginal cell squarely (not obliquely) truncate; second s.m. not narrowed to a point above.

The following measurements are in microns: basal nervure on first discoidal, 1,472; first submarginal (s.m.) on first discoidal, 928; first s.m. on marginal, 528; second s.m. on marginal, 128; third s.m. on marginal, 368; width of truncate end of marginal, about 128; second s.m. on first discoidal, 192; distance between ends of recurrent nervures on second s.m., 272; end of second r.n. to lower end of second t.c., 80; lower side of third s.m., 448.

The general structure is essentially as in the living *O. tuberculocephalus* Sauss. (Boulder, Colo., *W. P. Cockerell;* det. Rohwer); but the abdomen is more as in *O. capra* Sauss. (Colorado Springs, Colo., *T. and W. Cockerell*, at flowers of *Ribes aureum:* det. Rohwer). The measurements readily distinguish this from the other species fossil at Florissant.

Miocene shales of Florissant, Wilson Ranch (*Wickham*).

Odynerus wilmattæ n. sp. (Eumenidæ).

Black, apparently with light bands on abdomen; length of head and thorax 3 mm., of abdomen about 4.5 mm. in bent position, but would be about 6.5 straightened out, of anterior wings 4.5 mm.; first abdominal segment rather small, in lateral profile only about 1 mm. deep, whereas the abdomen in middle is fully 2 mm.; wings dusky reddish, venation ordinary, marginal cell very narrowly obliquely truncate at end; third t.c. arched inward; second s.m. greatly narrowed above, receiving first r.n. a little before middle

and second very near end (very much nearer end than in the living *O. tuberculiceps*, *O. capra* and *O. parietum*); second r.n. at right angles to lower side of third s.m.

The following measurements are in microns: second s.m. on marginal cell, 64; third s.m. on marginal, 256; lower side of marginal beyond third s.m., 384; lower side of third s.m., 384; end of first r.n. to end of second, 176.

Station 14, Miocene shales of Florissant (*Wilmatte P. Cockerell*). Very easily known from other fossil (as well as living) species by the remarkably short wings. It has also been examined by Mr. S. A. Rohwer, who cannot find any reason for regarding it as a distinct genus, notwithstanding its peculiar appearance. The anterior wings reach only a little beyond end of second abdominal segment. The wings, as preserved, are not longitudinally folded.

Palæovespa wilsoni n. sp. (Vespidæ).

♀. Length about 15 mm., anterior wing about or hardly 9 mm., first discoidal cell 4 mm.; robust, head and thorax black, abdomen paler, probably yellow in life, as also the legs; wings clear, veins nearly colorless (costo-apical region lost); first discoidal cell slightly oblique at end; second recurrent nervure ending more than twice as far from first as from end of second s.m.

The following measurements are in microns: basal nervure on first discoidal cell, 2,550; first discoidal on first submarginal cell, 1,760; first discoidal on second submarginal, 144; third discoidal on second submarginal, 480; lower side of second s.m. beyond third discoidal, 192; lower side of third discoidal 1,840; lower side of third submarginal, 640; third discoidal on second discoidal, 512; outer side of second discoidal below third discoidal, 288.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*). Named after the owner of the ranch where the fossils were collected, who did everything in his power to aid the work. Nearest to *P. gillettei* Ckll., but differing in the venation too much to be regarded as a variation.

Andrena percontusa n. sp. (Andrenidæ).

♀. Length 12 mm., anterior wing about 8 mm.; head and thorax black, abdomen pale; antennæ ferruginous; wings clear, venation ferruginous; basal nervure falling short of the very oblique transversomedial; stigma large; first r.n. joining second s.m. near end.

The following measurements are in microns: depth of stigma, 320; first s.m. on basal nervure, 368; lower side of first s.m., 1,040; second

s.m. on first discoidal cell, 480; second s.m. on third discoidal, 64; lower side of third s.m., about 800; distance between lower end of b.n. and upper end of t.m., 64.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*). Apparently a quite typical *Andrena*. It is easily known from *A. grandipes* Ckll. and *A. hypolitha* Ckll. by the venation. The venation is like that of *A. sepulta* Ckll. and *A. clavula* Ckll., but these are much smaller species, and *clavula* is also separated by the form of the abdomen.

Cladius petrinus n. sp. (Tenthredinidæ).

♀. Length 7.5 mm., robust; antennæ 3.65 mm. long, simple, rather slender; width of head 1.85 mm.; head and posterior half of thorax apparently black, rest of thorax and abdomen probably reddish in life; wings clear, with very pale nervures; 4.25 mm. from base of wing to middle of stigma. The end of the best wing is lost, so that it is impossible to determine from it whether the marginal cell has a cross-vein. The other wing is over the body and it is hard to see the details, but the marginal nervure is sufficiently plain, and I am confident that there is no cross-nervure. This accords with *Cladius*, with which the rest of the wing closely agrees. The insect runs in Rohwer's table (*Bull. Amer. Mus. N. Hist.*, XXIV, p. 521) to 20, and runs out on account of the character of the lanceolate cell. If it had a marginal cross-nervure, it would run to *Hemichroa cophila* Ckll., which is larger and otherwise different. There is no particular resemblance to any more recently described species. Compared with MacGillivray's figure of *Cladius pectinicornis*, the anterior wing differs as follows: first s.m. longer; second t.c. bowed inward; t.m. much beyond middle of second part of lanceolate cell; end of second r.n. only a very short distance beyond second t.c. It agrees in the sides of the first discoidal cell being not at all parallel, the long and narrow second discoidal, the very short upper side of first discoidal, etc. The separation of the two parts of the lanceolate cell by a single (coalesced) nervure is very short indeed, only 128 microns.

The following measurements are in microns: length of first submarginal cell (s.m.), 240; second s.m. on marginal, 928; first discoidal on first s.m., 288 (the thickness of the nervures explains the difference from the inside measurement of first s.m.); second s.m. on first discoidal, 432; second s.m. on third discoidal (not allowing for the strong curve), 1,040; third s.m. on third discoidal, 96; third s.m. from second r.n. to end (apparently, from the obscurely preserved wing), 656; first discoidal on basal nervure, 1,200; lower end of basal

nervure to upper end of the very oblique t.m., 640; first discoidal on second discoidal, 704; first discoidal on third discoidal, 368; length of t.m., 480; submedian cell on second part (beyond the interruption) of lanceolate cell, 1,280; second discoidal on lanceolate (anal) cell, 768; lower side of second discoidal beyond lanceolate cell, 400.

Miocene shales of Florissant, Wilson Ranch (*Wickham*).

Eriocampa celata n. sp. (Tenthredinidæ).

Length 8 mm., abdomen 4, anterior wing 6 mm.; ferruginous, with the head, posterior half of thorax and apex of abdomen apparently black; legs ferruginous; anterior wings reddish hyaline, nervures pallid; antennæ ordinary, not clavate, width at about 1,600 microns from base 208 microns; insect, as preserved, so like *Cladius petrinus* that I assumed it to be the same until I examined the venation. The venation appears to agree well with *Eriocampa*. In Rohwer's table the insect does not agree with *Eriocampa* because the first r.n. is not parallel with the b.n., the upper end of the r.n. being about 208 microns too far apicad; but nearly the same thing is true of *E. ovata*, as figured by MacGillivray (*Nortonella* has the same feature, but is otherwise quite different). Characteristic features of *E. celata* are the oblique, gently arched cross-vein of marginal cell, which joins the stigma 208 microns below the costa; the produced lower apical corner of first s.m.; the two sides of first discoidal cell (on basal and recurrent nervures) nearly equal; the second s.m. receiving only one r.n.; the very narrow (112 microns) top of first discoidal cell. The lanceolate cell is contracted, but not closed; the cross-nervure, which ought to be present, is obliterated, but I think I can see the stump of the upper end (this, however, is not positive).

The following measurements are in microns: first s.m. on marginal, 288; second s.m. on marginal (not allowing for curve), 800; end of second t.c. to lower end of marginal cross-vein, 608; lower end of marginal cross-vein to upper end of third t.c., 368; first s.m. diagonally, 448; first discoidal on first s.m., 480; first discoidal on second s.m., 416; basal on first discoidal, 832; first discoidal on third, 800; lower end of b.n. to upper end of t.m., 288 on one side, but 208 on opposite wing; upper end of t.m. to lower end of first r.n., 512. Known from the Florissant species of *Eriocampa* by the colors and the venation—*e.g.*, from *E. synthetica*, *pristina* and *wheeleri* by the measurements of the first discoidal cell; from *scudderi* and *bruesi* by the comparative measurements of the first two submarginals.

Miocene shales of Florissant, Wilson Ranch (*Wickham*).

DIPTERA.

Protolomatia antiqua Cockerell (Bombyliidæ).

The reverse of the type has been found and shows some of the details of the venation better than the original specimen. It shows, in particular, that the upper basal corner of second submarginal cell has a short accessory nervure pointing directly basad; consequently, in my table in *Bull. Amer. Mus. Nat. Hist.*, XXXIII, p. 233, the genus runs straight to *Alepidophora*. The insect is, however, very distinct from *Alepidophora pealei* in a variety of ways, such as the more widely open first posterior cell, the quite different shape of the second posterior, and the shape of the end of the marginal cell. The end of the marginal cell in *A. pealei* is like that of *Paracosmus morrisoni*, whereas in *P. antiqua* it is as in *Paracosmus insolens*. In the original account of *A. pealei*, it appears that the præfurca is practically obsolete, but a new study of the type shows that this is an error of interpretation, owing to the condition of preservation; the præfurca is actually 880 microns long in *A. pealei*, while the first basal cell on the first submarginal is 2,240 microns.

In the reverse of *P. antiqua* the abdomen appears reddish, conspicuously lighter than the thorax; it is not banded like that of *A. pealei*.

A new and much more complete set of measurements (in microns) of *P. antiqua* is offered. Length of præfurca, 592; width (depth) of marginal cell near end, 480; first submarginal on wing margin (not allowing for curve), 850; squared basal end of second submarginal, 272; second submarginal on first posterior, 1,184; first basal on first submarginal, 1,472; first posterior on first submarginal, 1,280; length of anterior cross-vein, 288; discal cell on first basal, 1,360; discal on first posterior, 608; width (depth) of discal cell at level of anterior cross-vein, 304; discal cell on second basal, 224; first posterior on wing-margin, 304; second posterior on discal, 280; second posterior on wing-margin, 800; second posterior on third, 992; third posterior on wing-margin, 720; fourth posterior on second basal, 128; greatest width of anal cell, 352; anal on wing-margin, 400.

Geron (?) platysoma n. sp. (Bombyliidæ).

Length about 10.5 mm.; thorax about 3 mm., the dorsum in lateral profile flat for about 2 mm.; length of wing, 7.5 mm.; abdomen with dorsal region alternately banded dark and light, the dark twice as broad as the light (as Becker figures for *Heterotropus glaucus*).

Wings clear, with light ferruginous nervures; venation as in *Geron gibbosus*, with anal cell closed well before wing-margin, but the discal cell is produced apically above and the anterior cross-vein is oblique; all the venational characters agree exactly with a *Geron* from Colorado.

The following measurements are in microns: first submarginal cell on wing margin, 608; length of præfurca, 400; first submarginal cell on first posterior, 1,664; first submarginal on first basal, 1,456; second submarginal on first posterior, about 1,920; first basal on discal, 1,184; first posterior on discal, 960; lower side of discal cell (on third posterior), 1,392; discal on second basal, 192; third posterior on second basal, 288.

Miocene shales of Florissant, Wilson Ranch (*Wickham*). The venation absolutely agrees with that of certain species of *Geron*, but the long, flattened thorax (perhaps partly distorted by pressure?) is very unlike that genus. The antennæ and proboscis cannot be made out. I suppose that the ancestors of *Geron* got the venation of the modern flies before they got the abbreviated form and humped thorax. The fossil should probably constitute a distinct genus, but it may provisionally remain in *Geron*, pending the discovery of better preserved material.

Heteromyiella miocenica n. sp. (Helomyzidæ).

Length 5 mm., wing 4.5 mm.; head, thorax and legs black; abdomen reddish, with scattered coarse bristles; wings reddish hyaline, without markings. Oral vibrissæ very large; anterior (or middle?) tibia with straight spur and curved preapical bristle. Venation normal; costa with many very short black bristles (practically as in *Heteromyiella senilis* = *Heteromyza senilis* Scudder), but no long ones; auxiliary vein distinct, complete and separate; anterior cross-vein below end of first vein; first posterior cell broadened in middle, the third vein distinctly arched upward (as in *Helomyza limbata*); second basal cell minute but distinct, anal cell also distinct.

Heteromyiella miocenica. End of tibia.

The following measurements are in microns: humeral cross-vein to end of first vein, 1,520; end of auxiliary vein to end of first vein, 400; second vein from point below end of first vein to wing-margin, 1,920; submarginal cell on wing margin (not allowing for curve), 592; submarginal cell on first posterior, 2,080; width of first posterior cell at level of end of discal, 448; first posterior on discal,

800; first posterior on second posterior, 1,120; discal cell on second posterior, 544; second posterior on third posterior, 320; first basal on discal, 1,250; second basal on discal, 112; anal on third posterior, 208.

Miocene shales of Florissant, Wilson Ranch (*Wickham*). It is rather remarkable that the *Heteromyiella* type, with only short bristles on the costa, should apparently (as shown by fossils from two or three localities) have been prevalent in North America in Tertiary times, whereas in the modern fauna it has given way to the genera with long as well as short bristles.

Empis miocenica n. sp. (Empididæ).

Length 5.5 mm., wing a little over 5.5, middle leg about 5; head about 1 mm. long, beak evident, but its length cannot be ascertained. Whole insect, as preserved, light ferruginous, the abdomen with dusky bands; wings reddish, with a very dilute stigmatal cloud. Only the upper part of the wing shows the venation clearly, but this appears to be quite normal for the genus.

The following measurements are in microns: end of first vein from base of wing, about 3,440; end of first vein to second (vertically) at same level, 144; end of first vein to end of second, about 1,600; separation of second and third veins from base of wing, about 1,120; the two branches of third vein are about equally long (1,120), the upper branch almost straight, with a very faint downward curve. The auxiliary vein can be seen very close to the first, but extremely weak and not reaching costa. The hind femora are large and stout, with a row of short, stiff, black spiniform bristles on the lower side. The anterior legs are lost.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*). Considerably larger and more robust than *E. florissantana*, with the head much smaller in proportion to the thorax.

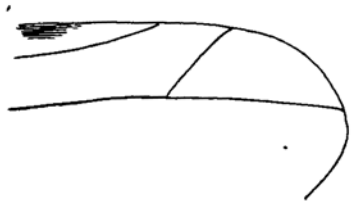
Empis florissantana n. sp. (Empididæ).

♀. Length about 4.50 mm.; wings 3.25, hyaline, except for a brown stigmatic cloud; middle legs about 4 mm. Face not hairy; head in lateral profile broad-oval; proboscis stout and stiff, much longer than head; thoracic dorsum dark; venation ordinary; hind femur reaching end of fifth abdominal segment.

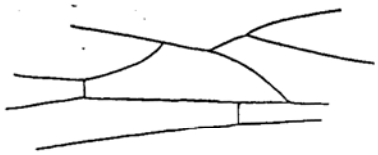
The following measurements are in microns: length of head, about 640; length of proboscis, about 1,040; anterior femur, about 1,040, its tibia about the same; end of second vein to end of anterior branch of third, 272; length of anterior branch of third, 320; length of

posterior or inferior branch of third, 672; apical width of first posterior cell, about 336; apical width of second posterior, about 320.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*). This appears to be a quite ordinary species of *Empis*. These are the first Empididæ to be described from Florissant.



Empis florissantana. Costo-apical region of wing.



Empis florissantana. Discal cell and adjacent parts.

Plecia axeliana n. sp. (Bibionidæ).

♀. Length about 8.5 mm., wing 9 mm.; thorax black with the mesothorax apparently red; abdomen banded dark and light, the light bands wider than the dark; wings reddish hyaline, suffusedly darker in costal region; head small, about 1.25 mm. diameter; venation normal.

The following measurements are in microns: depth of marginal cell at level of anterior cross-vein, 480; depth of submarginal cell at level of end of second vein (so-called anterior branch of third), 480; distance from end of second vein to end of third, about 1,760; distance in a straight line from base of marginal cell to separation of second vein from third, 2,880; length of the rather oblique anterior cross-vein, 272; lower end of anterior cross-vein to fork of fourth, 752.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*). Much larger than *P. melanderi* Ckll. (♂), with the abdomen quite differently marked; but in view of the sexual dimorphism in this family, it may be the female of *melanderi*. I have given it a name

derived from Professor Melander's given name, to serve as an indication of this probability. It seems inadvisable to assume identity, as it is improbable that it can be proved, and since the insects appear different, it is desirable to know which is referred to in any particular citation. When describing *P. melanderi* I remarked on the lengthening of the stem of the fourth vein, between the anterior cross-vein and the fork. In *P. plagiata* Wied. (det. Knab) from Quirigua, Guatemala (*W. P. Cockerell*), it is exactly as long (752 microns) as in *P. axeliana*. *P. plagiata*, however, differs radically from *P. axeliana* and *melanderi* in having the second vein (or upper branch of third) directed vertically upward, so that it looks like a cross-vein.

Bibio wickhami n. sp. (Bibionidæ).

♀. Length about 12 mm.; wing 6.75; proboscis 2 mm.; hind femur 3 mm.; second posterior cell slightly over 2.5 mm. long. Head, thorax and legs black; abdomen dark brown, the sutures colorless; wings clear, the costal region slightly brownish, veins pale reddish. The stem of third vein, before the cross-vein (following the usual interpretation), is 576 microns long, while the cross-vein is only about 80. The cross-vein leaves the fourth at a slight angle, and is in a straight line with the part of the third (2 + 3) beyond it, the third being abruptly bent at the cross-vein. This is nearly as in the living *Bibio albipennis*, but is very different from the Florissant fossil *B. atavus*, in which the stem of fourth before the cross-vein is only about 320 microns, while the oblique cross-vein is about 1,040, being almost as long as the stem of fourth vein between the cross-vein and the fork (basal corner of second posterior cell).

Miocene shales of Florissant, Wilson Ranch (*Wickham*).

Mycomya lithomendax n. sp. (Mycetophilidæ).

Length nearly 5.5 mm., abdomen 4, wing 4 mm.; anterior tibia about 1.5 mm., its tarsus 2.5; microscopical measurements give the following in microns: anterior tibia, 1,392: its basitarsus, 1,120: length of antennæ, 1,920. Dorsum of thorax and abdomen dark brown, the abdominal sutures rather broadly pallid; tibiæ and tarsi brown, femora pallid; hind femora with a row of short black bristles on under side; wings reddish hyaline, without markings. The thorax (seen in lateral profile) is much more elevated or humped than in *M. cockerelli* Joh. The venation nearly agrees with that of *M. cockerelli*, but differs in some small details. The subcosta (I follow Johannsen's nomenclature) ends on the costa as usual, its upwardly directed end, beyond the cross-vein, is 128 (all measurements in microns) long; the cross-vein to radius is 192 beyond base

of the small cell R_1, and is about the middle of that cell, which is quite long, as in *M. obliqua* (Say). The apical end of cell R has its upper face (above separation of lower branch of radius from radio-medial cross-vein) 128 microns long, and the lower face (radio-medial cross-vein) 192 and more oblique; this is almost as in *M. maxima* Joh.

Miocene shales of Florissant, Wilson Ranch (*Wickham*). Larger than the fossil *M. cockerelli*, and differing in coloration, details of the venation, and the proportions of the legs. It appears to be very close to the living *M. mendax* Joh., a species of the Pacific coast region.

Asilus wickhami n. sp. (Asilidæ).

Length 18.5 mm., of which 13.25 is abdomen; wings about 11 mm.; middle femora 3 mm., hind femora 4. Antennæ normal; the head and thorax were apparently black, the abdomen paler, somewhat darker dorsally than ventrally; legs without conspicuous bristles, tarsi thick; wings clear, nervures ferruginous. Bristles on the legs can be seen with the compound microscope, but they are pale or reddish, not black as in most species, and so are easily overlooked.

As in *A. peritulus* Ckll., the veins at the end of the second basal and fourth posterior cells form a cross; but in some other respects the venation differs from that of *A. peritulus* as follows:

(1) Marginal cell not so narrow at end.

(2) Sides of second submarginal beyond base parallel until near apex, when they gradually diverge; in *A. peritulus* the sides have a gentle double curve.

(3) Second posterior cell broader at base.

(4) Anterior cross-vein about middle of discal cell; *i.e.*, 1,440 microns from base and 1,330 from apex.

Wilson Ranch, Miocene shales of Florissant (*H. F. Wickham*).