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THE PRINCIPLE WHICH UNDERLIES THE CHANGES IN THE NEURURATION.

BY A. RADCLIFFE GROTE, A. M., HILDESHEIM, GERMANY.

In developing a general view of the changes in the neururation of the lepidopterous wing, the mass of detail in any one paper may obscure, for the reader, the statement of the assumed plan of progression. This seems to be, briefly, a simplification of the longitudinal systems of veining, and attained through a process of reduction. Where this progress would interfere with the serviceableness of the organ, the dormant tracheæ in the tegument may, in special cases, develop accessory veins, such as the humeral spurs of the Lachneids, the cross branches and extra veins in Tineides, and, as I have suggested, the so-called precostal spur (at one time vein I. of Comstock) on the hind wings of the diurnals. The cubital and discal cross-veins may be, however, survivals of a former system of cross-veins, since we apprehend them in various stages of retrogression. But they may be also what I call sub-secondary: produced at one time to be abandoned at another. Still, this latter is a rather violent theory. It is better to adopt the view that there is a general simplification going on controlled by mechanical causes and subsidiary to the habit and changes in habit of the organism, and which includes these two cross-veins.

In this general movement the participating longitudinal veins are as follows :

The branches of the radius.

These, on primaries, are still oftenest of the primitive number, five; on secondaries Comstock shows that the first radial branch survives some-

times as the outer margin of the humeral cell, fusing above with subcostal. The movement here is longitudinal, from base of wing outwardly to external margin. On the primaries some of the most specialized forms of Pierids and Lycænids have only three branches remaining. On the hind wings the radius is already two- or one-branched; the remainder of the five primitive branches have been lost in the higher lepidoptera, but retained in *Hepialus* and the Micropterygides. The details of the process by which the radial branches of the fore wings have been reduced in number become apparent through a comparison of their present position in the various genera.

The branches of the media,

which, as a rule three in number, alone survive of the system, are situated between cross-vein and outer margin of the wing. The base of the median system, as shown by Comstock, has disappeared and is again only exhibited in the Tineides. This base consisted of two, at least, longitudinal veins, which traversed the discal cell, and the traces of which are now to be found in certain backward spurs which remain attached to the cross-vein on its inner side. The reduction has taken place from the base outwardly. The branches themselves move upwardly or downwardly, attaching themselves to the system of the radius or that of the cubitus; the cross-vein degenerating as a further stage in the disappearance of the median system. For this is doomed. The wing tends to divide into two halves—the radius and its system, the cubitus and its system. To the first belongs naturally, by position, the subcostal vein; to the latter, the anal veins. The most perfect examples of this reduction are found in the Attacinæ. Take our common *Samia cecropia* or *Philosomia cynthia*. Here the cell has opened, the discal cross-vein has vanished, the branches of the media have attached themselves to the radial and cubital systems, deriving their nutrition from these, and the wing is centrally opened, from external margin to base, and free from veins. It presents now a certain coincidence with the embryonal or pupal wing, which is in itself curious, but need not detain us. We must finally notice the fact, that sometimes the branches refuse to follow the attraction of the upper and underlying systems. It is the middle or second median branchlet which is decisive. When this becomes radial, it follows the first median branch and attaches itself to the radial system. When it becomes cubital, it follows the third median branch and attaches itself to the cubital system. But sometimes it remains neutral. It will

not go either way, but obstinately retains its original primitive central position. This happens in the Skippers and Noctuids. The result is that the vein becomes isolated by the disintegration of the supporting discal cross-vein, a process which is never stayed. Then the second median branch, deprived of support and nutriment, fades away. For particulars of this theory of the movement of the median branches, see various articles issued by me in the years 1897 to 1899. The radial position is assumed by the Pierids and Nymphalids, also the Nemeobiidæ. The cubital, by the Papilionides and Dismorphians, which latter include *Leucophasia*. The central position is retained by the Skippers, apparently yielding to the cubital in the Megathymidæ. The movements of the radial branches and the median may be traced in all lepidoptera. Although I have worked them out chiefly from the diurnals, they are intelligible only as part of a system generally applicable. All genera of butterflies show the wings in comparative stages of advance in this respect. For instance, let us compare the wings of *Parnassius* with those of *Papilio*. These movements, which are frozen in the Swallow-tails, are released in the Apollo butterfly and its kindred; in other words: *Parnassius* is seen to be here the specialized and *Papilio* the relatively generalized form. I say *relatively*, because all these changes are gradual and one form must be compared with another to ascertain the difference in extent of these two movements. The grades are innumerable, established by the delicate differences of these natural instruments of measure. Another truth, which I have dwelt upon elsewhere, may now find its place: *The specializations, of the two systems and of all other features in the wing, are unequal.* This prevents snap judgment as to which is *ahead*, and which is *behind*, when we discuss the position of different groups and endeavor to establish it by a single feature. Rank is not an absolute and determinable condition in all cases; the specializations of moths may exceed those of butterflies. Moths may represent younger forms and butterflies may be older than we might suppose. We now come to

The anal veins,

which are theoretically four in number. The first anal (submedian fold) has disappeared as a vein, and appears only as a fold in most generalized forms. The fourth and third anal veins depart one after the other; the second anal is alone permanent. The Hesperiades have two anal veins remaining, the second and third; the Papilionides only one, the second.

The stationary veins

in the lepidopterous wing are, then, the subcostal, the main stem of the radius, the cubitus with its two invariable branches (cases occur in which a fourth median branch is noted), and the second anal vein.

It remains to state that accessory or secondarily developed veins always seem to be joined on to other veins, their object being to strengthen the tegument in some particular part of the wing which the changes above detailed have left weak. A curious way in which veins have become bent, in order to support the peculiar shape of the wing, has been detailed in my papers on the "Round-wing," *Pseudopontia paradoxa*. Another curious case is that of the fusion of the first and second radial branches, just before tip of fore wing, in *Perente callinice*. The first radial here fails to reach the outer margin, and the object seems to be to strengthen the apical field, left weak by the reduction of the radial branches.

If this localization of the secondary veins, which I assume, be correct, it follows that all veins issuing from base of wing are, *ipso facto*, primary, carried over from primitive types of insects. The short, downwardly curved internal vein, which I have taken as the visible sign of the Papilionides, is, then, a true third anal vein, or what remains of one, and is not to be considered as of secondary origin and value.

TYPES OF NOCTUID GENERA.

BY A. RADCLIFFE GROTE, A. M.

In reference to my previous paper (page 209), Mr. Louis B. Prout kindly draws my attention to the fact that Duponchel, Lep. Ent., March, 1829, also selects *didyma* as type of *Apamea*, Ochs., 1816. While it is gratifying that I had come independently to the same conclusion with regard to this type, I cannot follow Duponchel's selection in other cases. I merely state the fact here, reserving details for a later occasion.

It further appears from Mr. Prout's researches that Curtis, who publishes later than Duponchel, viz., in May, 1829, "chooses *chryso-grapha*" as type of *Apamea*. Independent of the fact that this choice is rendered nugatory from Duponchel's prior action, I do not identify this name with certainty as referring to one of Ochseneimer's original species of *Apamea*. Great confusion has been caused by the double employment of *nictitans* for two distinct forms. It was owing to the fact that I incorrectly supposed Ochseneimer's *nictitans* (= *oculea*) was Linne's

species, our common *Hydræcia nictitans*, L. (= *americana*, Speyer ; *lusca*, Harris), that I used *Apamea* at one time for this species. The species *leucostigma*, type of *Helotropha*, Led., formed one of Guenée's original species of *Hydræcia*, Guen., Noct. Eur. Index Meth., 1841, as also of Oechsenheimer's *Apamea*. But, in 1852, Guenée referred *leucostigma* back to *Apamea*, leaving *nictitans*, L., as type of *Hydræcia* by process of exhaustion.

Mr. Prout's kind communication does not affect the conclusions I have reached so far as to types of Noctuid genera.

NOMADA SAYI AND TWO RELATED NEW SPECIES.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

In *Trans. Am. Ent. Soc.*, 20 : 276, 1893, I described *Nomada Sayi* from eight female and fifteen male specimens. At present I have forty-five female and ninety male specimens which I have referred to this species, but which I now propose to describe under the three following names :

Nomada Sayi, Rob.—♀. Mandibles simple, antennæ long, joint 4 longer than 3 or 5, as long as 12, or nearly so, pygidium rather broadly truncate ; scutellum sub-bilobed, prominent ; enclosure of metathorax coarsely reticulated at base, finely roughened beyond ; head and thorax closely and coarsely punctured ; abdomen shining, rather sparsely and finely punctured ; ferruginous, the scape, front and middle legs, tubercles and tegulæ, more yellowish ; about antennæ, about ocelli, occiput, band on mesonotum, middle of metathorax sometimes, band from wings to middle and hind coxæ, base of femora behind more or less, sometimes hind metatarsi, base of abdomen, sometimes apical margins of segments more or less, and sutures, generally black or blackish ; segments 2 and 3 of abdomen with a yellow spot on each side ; wings hyaline, marginal cell and apical margins clouded, basal nervure ending before transverse median. Length, 6–8 mm.

♂.—Resembles the female ; joint 4 of antennæ longer than 3 or 5, as long as 13, or nearly so, 5–8 sub-lobate at apex beneath : pygidium bifid ; black, mandibles, labrum, clypeus, sometimes a spot above, inferior orbits as high as antennæ in front and usually at base behind, and scape in front, yellow ; sometimes a ferruginous spot at summit of eye ; flagellum yellowish ferruginous, except towards base above ; collar black or with a yellow or ferruginous interrupted line ; tubercles, tegulæ,

and usually a spot on pleura, yellow; scutellum black or ferruginous, or with two ferruginous or yellow spots; postscutellum usually black, sometimes ferruginous; legs, except base, especially behind on middle and hind pairs, ferruginous, front and middle legs more yellowish in front; abdomen except base and apical margins of segments more or less ferruginous, yellow marks on segments as follows: A spot on each side of 1-5, sometimes continuous, or nearly so, on 2, 4 and 5, sometimes broken in two on 4, often wanting on 1, 4 and 5, and a transverse spot on 6. Length, 6-8 mm.

Carlinville, Illinois; 18 ♀, 26 ♂ specimens.

Nomada Illinoensis, n. sp. — ♀. Closely resembles female of *N. Sayi*; antennæ shorter, joint 4 longer than 3, a little longer than 5, distinctly shorter than 12; scutellum a little less prominent; pygidium broader, broadly rounded, not truncate, more densely and finely punctured, more densely clothed with appressed pubescence; sides of face below more yellow; abdomen with a spot on each side of segments 2 and 3; 5 with a transverse spot, usually divided, sometimes wanting. Length, 6-8 mm.

♂.—Resembles the male of *N. Sayi*; joint 4 of antennæ shorter than 13. Length, 6-8 mm.

Carlinville, Illinois; 26 ♀, 54 ♂ specimens.

Nomada parva, n. sp.—♀. Resembles the female of *N. Illinoensis*, but is a little smaller; joint 4 of antennæ longer than 3, about equalling 5, shorter than 12; abdomen with a yellow spot on each side of segments 2-5. Length, 5 mm.

♂.—Scape stout, joint 4 of antennæ longer than 3, a little longer than 5, much shorter than 13, 5-8 not sub-lobate at apex beneath; pygidium bifid; black, mandibles, labrum, clypeus except sometimes at base, lower anterior orbits, scape in front, flagellum except at base above, tubercles, tegulæ, sometimes a spot on pleura and legs in front, yellow; abdomen reddish, segments 4-6 more or less blackish; yellow markings on segments of abdomen as follows: A spot on each side of 2 and 3; one or two spots on each side of 4, sometimes wanting; a band on 5 narrowed or interrupted medially, and sometimes a spot on each extreme side, all sometimes wanting; a transverse spot on 6. Length, 5-6 mm.

Carlinville, Illinois; 1 ♀, 10 ♂ specimens.

N. Illinoensis ♀ may be distinguished from the female of *N. Sayi* by the form of the pygidium and the joints of antennae. All of the specimens of *N. Sayi* ♀ have the abdomen four-spotted. In all except two specimens of *N. Illinoensis* ♀ the abdomen is five-spotted, or six spotted, when the mark on segment 4 is broken in two. The single specimen of *N. parva* ♀ has the abdomen eight-spotted. I separate the ♂ of *N. Illinoensis* from that of *N. Sayi* by the joints of antennae. In *N. parva* ♂ the scape is stouter, and the ornaments of abdomen are different.

N. Sayi is closely related to *N. Cressonii*, differing mainly in size and colour.

CLASSIFICATION OF THE FOSSORIAL, PREDACEOUS AND PARASITIC WASPS, OR THE SUPERFAMILY VESPOIDEA.

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

(Paper No. 3.—Continued from page 188.)

SUBFAMILY II. *Ageniinae*.

The majority of the species falling in this subfamily are usually smaller and much less conspicuous than those in the other subfamilies, and with totally different habits. None are true diggers, but, on the contrary, build small oblong, or oval, clay cells, beneath the loose bark of old trees, under stones, or in crevices in old stone walls, etc., not unlike some of the Potter wasps (*Euementidæ*).

The group comes evidently nearest to the *Pepsinæ*, the females having, as in that group, a transverse grooved line, impression or emargination on the second ventral segment. From that group, however, it is at once separated by the difference in the legs, the hind tibiae being smooth, never serrate or spinous, or with a longitudinal ridge, but, at the most, with only a few very minute, scarcely perceptible spines.

These characters readily distinguish the *Ageniinae* from all other Pompilids.

The beginner at first might possibly confuse some males in this group with some small males belonging in the subfamily *Pompilinae*, since there is a superficial resemblance in some, but strongly spined legs, always existing in the males of the latter group, ought readily to differentiate the two.

Only five genera fall into this group, distinguishable as follows :

Table of Genera.

- Cubitus in hind wings *interstitial* with the transverse median nervure. . 2.
 Cubitus in hind wings originating *beyond* the transverse median nervure. . 4.
2. Mesosternum normal, unarmed. 3.
 Mesosternum armed with a large conical tooth or spine just before the middle coxæ.
 Second and third cubital cells along the cubitus subequal, the third the broadest ; femora in ♂ much thickened. (1) *Macromeris*, Lepel.
3. Second and third cubital cells equal, or very nearly, united only about as long as the first.
 Mandibles simple, edentate ; antennæ in ♂ with the flagellar joints pectinate (♀ unknown). (2) *Clavelia*, Lucas.
 Mandibles bidentate ; antennæ in ♂ normal, the hind coxæ produced anteriorly into a conical tubercle, in ♀ simple ; metathorax with a median longitudinal furrow. (3) *Paragenia*, Bingham.
 Second cubital cell much shorter than the third ; clypeus usually triangular, more or less prominently pointed, subconvex medially ; mandibles dentate ; antennæ filiform. (4) *Pseudagenia*, Kohl.
4. Third cubital cell, along the cubitus, as long or a little longer than the second ; claws cleft or with a tooth near the middle, rarely simple ; eyes extending to base of mandibles ; abdomen with a constriction between segments 1 and 2.
 Body variable ; head transverse, wider than the thorax ; maxillæ in ♀ with a bunch of long, beardlike hairs at base ; abdomen ovoid, sessile, subsessile, or briefly petiolate ; claws cleft or with a tooth beneath. (5) *Agénia*, Schiödte.
 = *Pogonius*, Dahlb.
- Body very slender ; head lenticular ; maxillæ in ♀ normal, not bearded ; abdomen very long, subcompressed, clavate, the first segment distinctly petiolate ; claws simple (6) *Stenagenia*, Saussure.

THE NEW MEXICO BEES OF THE GENUS *CÆLIOXYS*.

BY T. D. A. COCKERELL, EAST LAS VEGAS, N. MEX.

Table to separate the females :

- Legs red 1.
 Legs black, or only tarsi red..... 4.
1. Anterior edge of clypeus deeply emarginate..... *Sayi*, Rob.
 Anterior edge of clypeus not emarginate..... 2.
2. Ventral apical plate of abdomen broad; dorsal abdominal segments closely punctured in the middle..... *deplanata*, Cress.
 Ventral apical plate of abdomen narrow..... 3.
3. Base of abdomen black; dorsal abdominal segments rather closely punctured in middle..... *octodentata*, Say.
 Base of abdomen red; dorsal abdominal segments very sparsely punctured in middle..... *menthae*, Ckll.
4. Apical dorsal plate prominently angled at sides. *rufitarsis*, Smith.
 Apical dorsal plate not angled at sides..... 5.
5. Apical ventral plate long and narrow, notched at sides near end.. 6.
 Apical ventral plate broad, suboval, more or less hairy at sides.. 7.
6. Lateral teeth of scutellum short and blunt; tegulae black; length about 9 mm..... *maxta*, Cress.
 Lateral teeth of scutellum longer and sharper; tegulae dark reddish; length about 12 mm..... *Porterae*, Ckll.
7. Apex of ventral plate with a very small projection; apex of dorsal plate curved upwards..... *Gilensis*, Ckll.
 Apex of ventral plate with a large projection; apex of dorsal plate not curved upwards..... 8.
- Apex of ventral plate without a projection; apex of dorsal plate not curved upwards... .. *Apacheorum*, Ckll.
8. Lateral teeth of scutellum long, somewhat curved inwards..... *grindeliae*, Ckll.
 Lateral teeth of scutellum shorter, slender, straight ... *ribis*, Ckll.

Cælioxys Sayi, Robertson, 1897.Las Cruces, June 12. Resembles *octodentata*, but easily separated by the clypeus.*Cælioxys deplanata*, Cresson, 1878.

Mesilla, June 30; Mesilla Park, October 14.

Cælioxys octodentata, Say, 1824, (*altilis*, Cress.).Santa Fé, July 6, at flowers of *Rudbeckia laciniata*; July 27; Albuquerque; Las Vegas, August 11, taken by Miss S. L. Mize, on

flowers of *Grindelia squarrosa*; West Fork Gila River, taken by Townsend, July 12. A male from flowers of *Aster spinosus* at Mesilla, July 25, is inseparable from males of *octodentata*.

Calioxys menthae, Ckll., 1897.

♂. Deming. ♀. Las Cruces, August 11 and August 23, the last at flowers of *Chrysopsis villosa*; both taken by C. H. T. Townsend. The ♀ is about 12 mm. long; the apical plates of the abdomen are of the same general type as those of *octodentata*, but longer, and the dorsal plate does not fall much short of the ventral. The bands of pubescence along the front of the mesothorax, and in the scutello-mesothoracic suture, are of a light warm ochreous colour. The abdominal bands are entire and regular.

Calioxys rufitarsis, Smith, 1854.

♀. Rio Ruidoso, about 7,500 feet, August 3, at flowers of *Verbena Macdougalii*. This specimen, collected by Townsend, differs from Smith's description by the black nervures, and tegulae not testaceous in the middle, but it accords herein with *rufitarsis* as understood by Cresson. The tarsi are red. What I regard as the ♂ of this occurred at Las Vegas, July 11, at flowers of *Cleome serrulata*. It is larger than *C. Gilensis*.

Calioxys maesta, Cresson, 1864.

Beulah, end of August.

Calioxys (lucrosa var. ?) Porterae, n. sp.

♀. Harvey's Ranch, near Las Vegas, 9,600 feet, August 22, 1899. (Wilmatte Porter.) Length about 12 mm. Pubescence white; short but rather dense on cheeks; short and mostly appressed on face; abundant on sides of thorax and on metathorax; erect, scanty and inconspicuous on vertex, mesothorax and scutellum; no band on anterior margin of mesothorax, and only a very slight one at scutello-mesothoracic suture; legs, except coxae, scarcely pubescent, four hind tarsi clothed with fulvous hair on inner side; abdominal bands narrow, not very conspicuous, inclined to be more or less interrupted in the middle; antennae and mandibles entirely black; tegulae dark reddish-brown; wings brownish; punctures of vertex, mesothorax and scutellum dense, large and deep, scutellum becoming cancellate; edge of scutellum only gently convex, with no central nodule, lateral teeth moderate, straight; abdomen shining, punctures sparse on greater part of segments 2 to 4; segments 2 and 3 with a transverse groove; ventral surface with distinct,

rather close punctures; penultimate ventral segment minutely roughened with dense punctures of two sizes; apical plates much as in *lucrosa*, but the dorsal plate has the narrowing nearer the base, and its keel is distinct; the ventral plate appears to be rather more produced. Close to *lucrosa* and *mesta*, but probably a distinct species.

Cælixys Gilensis, Ckll., 1898.

Length: ♂, 9-10 mm.; ♀, 11 mm. The discovery of the female shows that this species is very close to *C. modesta*, Smith, but differs in the colour of the legs and the entire abdominal bands. ♀. Gallinas River at La Cueva, at flowers of *Psaralea tenuiflora*, August 6 (Ckll.); Rio Ruidoso, at flowers of *Vicia* aff. *pulchella*, about 6,700 feet, July 29 (Townsend). ♂. Rio Ruidoso, with the ♀s just cited, also at flowers of *Rhus glabra*, about 6,500 feet, July 19 (Townsend); Gila River (Townsend); Santa Fé, July 6 (Ckll.). The males resemble *rufitarsis*, but are uniformly smaller.

Cælixys Apacheorum, n. sp.

Mescalero, July 20 (C. M. Barber). ♀. Somewhat related to *C. alternata*, Say, as interpreted by Cresson. Length 11 mm., narrow, with the shape of *C. Gilensis*; pubescence dull white; face quite densely pubescent; anterior border of mesothorax with the band of pubescence divided behind into three teeth, the lateral ones the most distinct; scutellum with hind edge strongly convex, without a central nodule; lateral teeth long and almost straight; antennæ and mandibles black; legs black, including tarsi; spurs dark ferruginous; punctures of mesothorax and scutellum large and deep; wings strongly suffused with brown; nervures black, stigma ferruginous; tegulæ ferruginous, piceous at base; abdomen shining dorsally, with strong but sparse punctures; abdominal bands regular and entire; additional bands of hair at the sides of the segments, marking the transverse depressions, which, however, entirely fail broadly in the middle of the dorsum; ventral surface strongly and rather closely punctured, the penultimate segment with small punctures interspersed between the large ones; apical dorsal segment ending in a point at an angle of perhaps 80°, the longitudinal keel wanting, or slightly indicated at the tip; apical ventral segment not greatly produced beyond the dorsal, rounded, its margins hairy.

This species is peculiar for the absence of a keel or raised line on the last dorsal segment, and the broad interruption of the transverse grooves on segments 2 and 3. Using these characters, our species of *Cælixys* separate thus:

- A. Keel on last dorsal absent *Apacheorum*.
 B. Keel on last dorsal extending about half the length of the segment ;
 transverse grooves on 2 and 3 entire. *octodentata*, *Sayi*.
 C. Keel on last dorsal extending about three-quarters the length of the
 segment.
 a. Transverse grooves on 2 and 3 interrupted in middle
 line. *mesta*.
 b. Transverse grooves on 2 and 3
 entire. *deplanata*, *ribis*, *rufitarsis*, *Porteræ*.
 D. Keel on last dorsal extending practically the whole length of the
 segment.
 a. Transverse grooves on 2 and 3 entire. *grindeliæ*.
 b. Transverse grooves on 2 and 3 broadly interrupted
 dorsally. *menthæ*, *Gilensis*.

Cælixys grindeliæ, n. sp.

Las Vegas, at flowers of *Grindelia squarrosa*, August 9, both sexes
 (W. Porter); August 11, ♂ (S. L. Mize).

Las Vegas, at flowers of *Solidago Canadensis*, August 11, ♂ (W.
 Porter); Las Vegas Hot Springs.

♀. Length about 11 mm.; pubescence pale with a brownish tinge,
 that along anterior margin of mesothorax (especially at sides) and a spot
 behind tegulæ, pale ferruginous; disc of mesothorax and scutellum
 nude; abdominal bands rather broad, entire and conspicuous, no short
 lateral transverse grooves or bands, but transverse grooves crossing the
 dorsum of segments 2 and 3; mandibles externally covered with
 appressed pubescence like the face (this is also the case in *ribis*);
 antennæ and tegulæ black; legs black, including tarsi; nervures and
 stigma black; wings with the outer margin broadly brown; mesothorax
 cancellate with extremely dense large punctures; lateral teeth of
 scutellum long; abdomen rather sparsely punctured; penultimate
 ventral segment punctured like the others, without the minute punctures
 interspersed; last dorsal segment densely punctured, with a strong
 raised line going as far as the articulating base; apical ventral segment
 longer than dorsal, broad, hairy at sides, with a broad apical pointed
 projection.

♂. Similar to the ♀, except in the usual sexual characters;
 pubescence often whiter than in ♀; end of abdomen with eight teeth,
 those on the fifth segment being well developed.

The punctuation of the penultimate ventral segment in the ♀ is diverse in the different species; thus in *rufitarsis*, *Porterae* and *Apacheorum* there are numerous small punctures interspersed among the large ones; in *menthae*, *Gilensis* and *grindeliae* the punctures are large, on a shining surface, without little ones interspersed; in *deplanata*, *ribis* and *mæsta* the punctures are small and very dense posteriorly, and larger and well separated on the anterior part of the segment.

Cælioxys ribis, n. sp.

Romeroville, April 29, 1899, at flowers of wild gooseberry (Wilmatte Porter). ♀. Length about 11 mm., rather broad, superficially like *C. grindeliae*, but the abdomen tapers more rapidly; the pubescence is white; the hair on the eyes is very long (it is very short in *grindeliae*); the inner orbital margins diverge much more above; the punctures of the mesothorax are sparser in the middle, leaving some shining surface between; the teeth of the scutellum are shorter; the apical projection of the last ventral segment is longer and narrower; the mesothorax is quite hairy, but has no distinct hair-patches; the penultimate ventral segment is dull, roughened with excessively close minute punctures posteriorly, sparsely punctured anteriorly.

SYNOPSIS OF FOOD-HABITS OF THE LARVÆ OF THE SESIIDÆ.

BY WILLIAM BEUTENMÜLLER, NEW YORK.

The larvæ are universally borers, but in the choice of food-plants there is the widest diversity; some bore through and devour solid wood, as do the larvæ of the Cossids; some prefer the pith of woody stems; others are found in the superficial woody layers; still others affect the roots of plants both woody and herbaceous, or are sometimes to be found in the borings made by other insects, as is the case with *Memythrus tricinctus*, *Sesia pictipes*, *S. scitula*, and others. The larvæ are yellowish or dirty white, beset with only a few short hairs. The head and cervical shield are chestnut brown. They hibernate in various stages of growth, but do not overwinter in the pupal stage, as far as the species of the northern States are concerned. The larvæ of *Melittia satyriniformis* hibernate fully grown in the cocoons. When fully developed they spin elongate oval cocoons composed of chips cemented together by a gummy secretion or silk. The cocoons are formed in the burrows or in contiguous places.

Boring in trees.

Under bark of trunks some distance from the base or in the branches :

Maple.....	<i>Sesia acerini.</i>
Maple.....	" <i>corni.</i>
Apple, Pear.....	" <i>pyri.</i>
Dogwood, Oak, Chestnut.....	" <i>scitula.</i>
Alder.....	" <i>Americana.</i>
Cherry, Plum, Juneberry.....	" <i>pictipes.</i>
Pine, Redwood (<i>Sequoia</i>).....	<i>Vespa minima sequoia.</i>
Pine and Spruce.....	<i>Parharmonia pini.</i>

Under bark at base of trunk or main roots :

Peach, Cherry, Plum, Apricot, etc.....	<i>Sanninoidea exitiosa.</i>
Peach and Cherry.....	" <i>opalescens.</i>
Peach, Cherry.....	" <i>Graefii.</i>

In solid wood of trunks :

Ash.....	<i>Podosesia syringæ.</i>
Ash.....	" <i>fraxini.</i>
Oak.....	<i>Memythrus simulans.</i>
Cottonwood.....	<i>Egeria pacifica.</i>
Cottonwood and Locust.....	<i>Memythrus robinia.</i>
Poplar.....	" <i>Dollii.</i>
Willow and Poplar.....	" <i>tricinctus.</i>
Willow.....	<i>Sesia Bolteri.</i>
Willow.....	" <i>albicornis.</i>

In solid wood at base of trunks and roots of trees :

Persimmon.....	<i>Sannina uroceriformis.</i>
Willow and Poplar.....	<i>Egeria apiformis.</i>
Willow.....	" <i>tibialis.</i>
Ash, Alder.....	<i>Memythrus asilipennis.</i>

Boring in shrubs.

In solid wood :

Lilac.....	<i>Podosesia syringæ.</i>
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In pith of stems :

Currant, Gooseberry.....	<i>Sesia tipuliformis.</i>
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In roots :

Blackberry and Raspberry.....	<i>Sesia rutilans.</i>
Blackberry and Raspberry.....	<i>Bembecia marginata.</i>
Sumac.....	<i>Melittia gloriosa.</i>

Boring in vines and creeping plants.

In the stems :

- Squash, Pumpkin, and other Cucurbs *Melittia satyriniformis*.
 Big-root (*Megarrhiza*) " *gloriosa*.

In roots :

- Grapevine *Memythrus polistiformis*.
 Clematis *Alcathoe caudata*.
 Clematis " *korites*.

Herbaceous perennial plants.

In roots :

- Strawberry *Sesia rutilans*.

In stem :

- Eupatorium* *Sesia lustrans*.

In borings of other insects :

- Oak-gall (*Andricus cornigerus*) *Sesia scitula*.
 Oak-gall (*Andricus cornigerus*) " *rubristigma*.
 Gall on Live Oak " *querci*.
 Gall on Oak " *sapygiformis*.
 Gall on Mesquite " *prosopis*.
 Gall of *Saperda concolor* " *albicornis*.
 Gall of *Saperda concolor* *Memythrus tricinctus*.

NOTES ON COLORADO BEES.

BY E. S. G. TITUS, FORT COLLINS, COLO.

The following table is intended to serve as a means of separating the species of the genus *Agapostemon*, Smith, occurring in Colorado :

Body green or blue-green.

A. Abdomen unicolorous with body.

B. Mesonotum with double punctuation *Texanus*, Cress. ♀.

BB. Mesonotum with confluent punctures, metathorax longitudinally rugose *radiatus*, Say. ♀.

AA. Abdomen differing in colour from body.

B. Abdomen black.

C. Abdomen yellow banded.

D. With five bands.

E. Last ventral segment with a median carina *viridulus*, Fab. ♂.

EE. Last ventral segment without a median carina *Texanus*, Cress. ♂.

- DD. With six bands radiatus, Say. ♂.
 CC. With white hair-bands viridulus, Fab. ♀.
 BB. Abdomen honey-yellow melliventris, Cress. ♀.
 BBB. Abdomen yellow, with very narrow black
 bands melliventris, Cress. ♂.

The males of radiatus, Texanus and viridulus are hard to satisfactorily separate. That portion of the table relating to them has been formed almost wholly from a study of the excellent paper of Mr. Chas. Robertson, North American Bees, Desc. and Syns.*, in connection with the study of the males in the collection of the Colo. Agr'l College. Specimens of male and female of radiatus, Texanus and viridulus were sent to Mr. Robertson, who kindly looked them over and verified or, where necessary, corrected my determinations.

The following is a list of the specimens now in the College collections :

Agapostemon viridulus, Fab., 1793.

Thirty-five females ; Trinidad, Ft. Collins and Poudre Canon.

Ten males ; Poudre Canon and Ft. Collins.

Taken on Salix, Taraxicum, Geranium, Opuntia and several Cruciferae.

Agapostemon radiatus, Say, 1837.

Two females, Delta ; two males, Montrose and Salida (Gillette), and one male, Poudre Forks (Laura Armstrong).

Females taken on Salix.

Agapostemon Texanus, Cress., 1872.

Seventy-four females ; Greeley, Lamar, Dolores, Trinidad, Ft. Collins and Rist Canon.

Twenty males ; Julesburg (Ball), Greeley, Fort Collins and Rist Canon. This species has been taken on Malvastrum coccinium, Salix, Taraxicum, Geranium and Cnicus.

Agapostemon melliventris, Cress., 1874.

One female at Delta, Colo., 27-v.-00, on Salix, by Prof. Gillette.

There are also in the collection a female taken in Mesilla Valley, N. M., on Solanum, and a male from Las Cruces, N. M., on Solidago, both from Prof. Cockerell.

Colletes nigrifrons, n. sp. ♀.

Length, 7-8 mm. Black, rather heavy set ; head broad, clypeus

*Trans. Acad. Sc., St. Louis, VII., No. 14, 1897.

prominent, punctures larger than on rest of face, partly confluent; face covered with short black hair; labrum with a distinct median depression; mandibles black, tips rufo-testaceous, notch one-fifth of length from the blunt tip, strongly grooved without, space between eyes and base of mandibles not as great as width of latter; antennæ short, black, flagellum deep brown beneath, reaching to line of tegulæ; cheeks sparsely fringed with short, black hair; dorsum of the thorax with short, sooty hair, some black hair internixed in spots, disc shiny, sparsely pubescent; pleura with black hair; thorax quite evenly sparsely punctured, post-scutellum more finely punctured, base of metathorax with transverse series of pits, triangle shining, not smooth; tegulæ shining, distinctly piceous; wings hyaline, nervures and stigma testaceous, marginal cell very dark, second submarginal narrow at top, third not narrowed as much as usual in one specimen; legs black with sooty pubescence, tarsi reddish with rufo-testaceous hair, first joint very dark; abdomen black, punctured, first two segments shining, white hair-bands on segments 1-5, on 1 and 2 interrupted, otherwise sparsely pubescent with black hair, venter with very short black hair.

Described from two females: Ft. Collins, Colo., 6-viii.-96 (Gillette), and Horsetooth Mt., Colo., 22-vi.-99, on *Potentilla*. This species differs from known Colorado species by the black hair on the face and pleura and the sooty hair on thorax. Prof. Cockerell writes that it is closely related to *C. pascoensis*, Ckll., from Washington; but differs by its smaller size and by possessing hair-bands.

I wish to acknowledge the kindness of Prof. Cockerell and Mr. Robertson for favours shown me in revising portions of my manuscript, and for the general help they have given me.

NOTES ON SOME NORTH AMERICAN SPECIES OF TINEIDÆ.

BY HARRISON G. DYAR, WASHINGTON, D. C.

About the time that Lord Walsingham's valuable paper on *Acrolophus* and *Anaphora* appeared (Trans. Ent. Soc., Lond., 1887, 137-173), Mr. Beutenmüller was working on the same group; but neither author has since attempted to recognize the species named by the other, so far as I am aware. In Prof. Smith's List Lep. Bor. Amer., 1891, the group is recognized as a family—*Anaphoridæ*—but this can hardly stand. The genera will fall in the *Tineidæ*, in the more restricted sense (see Walsing-

ham, Proc. Zool. Soc., London, 1897, 139-175). The following synopsis of genera is from Walsingham, with addition of two genera described since the original publication :

ANAPHORINÆ.

Palpi erect or slightly recurved.

Veins 8 and 9 of fore wing stalked.

Palpi erect *Eulepiste*.

Palpi appressed to head *Neolophus*.

Veins 8 and 9 separate.

Antennæ bipectinate *Ankistrophorus*.

Antennæ simple or serrate towards apex.

Tarsal joints of hind legs strongly fringed above . . . *Thysanoskelis*.

Tarsal joints not fringed above.

Palpi erect, with separate tufts on each joint *Ortholophus*.

Palpi slightly recurved, uniformly hirsute *Pseudanaphora*.

Palpi strongly recurved.

Antennæ bipectinate *Felderia*.

Antennæ serrate throughout.

Veins 8 and 9 of fore wings stalked *Cænogenes*.

Veins 8 and 9 of fore wings separate *Anaphora*.

Antennæ simple, compressed, or slightly serrate at ends.

Veins 7 and 8 of fore wings stalked *Atopocera*.

Veins 8 and 9 of fore wings stalked.

Head with an erect crest *Urbara*.

Head without an erect crest *Hypoclopus*.

No veins of fore wings stalked.

Palpi roughly clothed throughout.

An erect fringe along lower margin of cell on hind

wings *Pilanaphora*.

No such erect fringe on hind wings *Acrolophus*.

Palpi smooth, the last joint only tufted *Staberhinus*.

Genus EULEPISTE, Walsingham.

Wals., Trans. Am. Ent. Soc., X., 169, 1882 ; Trans. Ent. Soc., Lond., 1887, 142.

Synopsis of Species.

Uncus single, the opposing lower limb not half as long as the upper limb.

Harpes concave, rounded at the ends *Cressoni*.

Harpes concave, obliquely truncate above *maculifer*.

Uncus single, its opposing lower limb nearly as long as the upper and stouter.

Harpes nearly flat, the ends bent inward, rounded. *Cockerelli*.

Eulepiste Cockerelli, n. sp.

Palpi upturned in front of the head, free, as high as the vertex ; male antennæ simple, slightly serrated toward the ends ; veins 8 and 9 of fore wing stalked ; thorax and fore wings dark brown-gray, somewhat grizzled or mottled with darker and with an obscure darker spot at the end of the cell. Hind wings dark brown ; abdomen gray-brown ; expanse 16 mm. One male, Mesilla Park, New Mexico, at light, July 8th (T. D. A. Cockerell) ; U. S. Nat. Mus., Type No. 4417.

Genus *HYPOCLOPUS*, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 141.

Synopsis of Species.

Uncus single, down curved, broad at base, tip pointed ; harpes broad, narrow at base, squarely truncate. *griseus*.

Uncus double, the two points separate, sharply down curved, the ends bent outward, enlarged and rounded ; harpes long, narrow and uniform. *mortipennellus*.

Hypoclopus griseus, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 144.

Arizona (Morrison, from Lord Walsingham, through C. V. Riley) ; San Diego, Texas, May 9 (E. A. Schwarz) ; Oracle, Arizona, June 28 (E. A. Schwarz) ; Brownsville, Texas, Apr. 27 (C. H. T. Townsend) ; Washington, D. C., July 20 (A. Busck).

The Texas specimens are pale, the ground colour an ashy white, on which the dark specks and streaks show plainly. The specimen from Oracle, Ariz., is very dark, the black markings predominating.

Hypoclopus mortipennellus, Grote.

Grote, CAN. ENT., IV., 137, 1872 ; XVIII., 199, 1886. Wals., Trans. Am. Ent. Soc., X., 167, 1882 ; Trans. Ent. Soc., Lond., 1887, 150 ; *quadripunctellus*, Beut. (ined.), Smith's List Lep. Bor. Amer., No. 5057, 1891.

This species, described as *Anaphora* and placed by Lord Walsingham in *Acrolophus*, may be removed to *Hypoclopus*, as a majority of the specimens have veins 7 and 8 of fore wings stalked, at least on one side. Of twelve specimens before me, seven have these veins stalked on

both sides, two stalked on one side, separate on the other, and two separate on both sides, though approximate at base. The form of the male genitalia is peculiar and exactly alike in both those specimens with the veins stalked and with them separate. In size and markings they are also inseparable.

Lord Walsingham remarks about a specimen with veins 8 and 9 stalked, in two places in his article (pages 151 and 155), and refers it in one place to *Neolophus*, in the other to *Cænogenes*; but the antennæ are serrate only towards the tip, and the male palpi are strongly recurved, so that neither of these references seems admissible.

Texas (coll. Beutenmüller, type of *quadripunctellus*); Texas, Sept. 20 (Belfrage); Central Missouri, Aug. 12 and 15 (coll. C. V. Riley); Kansas (Crevecoeur); Georgia (coll. Beutenmüller); Texas (coll. Beutenmüller, labelled "compared with type of *A. mortipenella* at Cambridge, Mass.").

Genus ACROLOPHUS, Poey.

Poey, Cent. Lep., Cuba, 1832; Wals., Trans. Ent. Soc., Lond., 1887, 147.

Synopsis of Species.

Uncus single, broad at base, the tip sharp.

Harpes slender, concave, obliquely truncate above. *simulatus*.

Uncus double. { *plumifrontellus*.

With supplementary lateral processes. { *cervinus*.

Without such processes.

Harpes slender, concave, uniform.

Tips of uncus down curved, separate. *Texanellus*.

Tips of uncus straight, bent only at base, more nearly

approximate *Hulstellus*.

Harpes spoon-shaped, narrowed at base.

Uncus with a tooth below at the base. { *Arizonellus*.

{ *violaceellus*.

Acrolophus cervinus, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 151; *angustipenellus*, Beut., Ent. Amer., III., 140, 1887; Smith's List Lep. Bor. Amer., No. 5049, 1891.

The genitalia of this form do not differ perceptibly from those of *plumifrontellus*, Clem. The moths are smaller, paler and less strongly marked, somewhat narrower winged; but I doubt the specific distinctness of the form.

Florida (coll. Beutenmüller, type of *angustipenellus*); Georgia (coll. Beutenmüller); Orange Co., Florida (coll. Beutenmüller); Texas (Boll. coll. C. V. Riley, identified by Walsingham); Columbus, Texas, June (E. A. Schwarz).

Acrolophus violaceus, Beutenmüller.

Beut., Ent. Amer., III., 139, 1887.

The genitalia are not very different from those of *Arizonellus*, Wals., though the harpes may be somewhat slenderer. However, the moth differs in its uniform, unspotted, purplish colour.

North Carolina (Beutenmüller's types); Iowa (from Dept. Agriculture).

Acrolophus Arizonellus, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 153.

Arizona (Morrison, from Lord Walsingham, through C. V. Riley); Mesilla, New Mexico, June 25 and July 1 (T. D. A. Cockerell); Tucson, Arizona, July 19, 20 and 21 (E. A. Schwarz).

Genus ANAPHORA, Clemens.

Clem., Proc. Ac. Nat. Sci., Phil., 1859, 261; Wals., Trans. Ent. Soc., Lond., 1887, 155.

Anaphora popeanella, Clemens.

Clem., Proc. Ac. Nat. Sci., Phil., 1859, 261; Wals., Trans. Ent. Soc., Lond., 1887, 161 (references and synonymy); Riley, Smith's List Lep. Bor. Am., No. 5061, 1891; *confusellus*, Beut. (ined.), Smith's List Lep. Bor. Am., No. 5056, 1891.

The form *confusellus* is smaller than the usual form, the ground colour lighter and more purplish, the dark marks strongly relieved. In genitalia there is no marked difference. The form differs from *popeanella* about as much as *Acrolophus cervinus*, Wals., does from *A. plumifrontellus*, Clem. U. S. Nat. Mus., type No. 405.

Georgia (Beutenmüller's type); Kirkwood, Missouri? (labelled only "148 M," i. e., Murtfeldt); Georgia (A. Oemler, labelled "Anaphora, n. sp., Wlsm., '86"); Georgia (labelled "Anaphora, n. sp., doubtless = *plumifrontellus*, C. V. R., '86, with Wlsm."); eight specimens, badly worn (labelled only "667, Aug., '80, coll. C. V. Riley").

Genus FELDERIA, Walsingham.

Wals. Trans. Ent. Soc., Lond., 1887, 165.

Felderia filicornis, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 165; *Mexicanellus*, Beut., Ent. Amer., IV., 29, 1888.

Arizona (Morrison, from Lord Walsingham, through C. V. Riley); City of Mexico (Beutenmüller's type of *Mexicanellus*); Oracle, Arizona, July 12 (E. A. Schwarz); Fort Grant, Arizona, July 20 (H. G. Hubbard); Brownsville, Texas, June 10 (C. H. T. Townsend).

Genus ORTHOLOPHUS, Walsingham.

Ortholophus variabilis, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 169.

Arizona (Morrison, from Lord Walsingham, through C. V. Riley); Arizona (coll. Beutenmüller); Arizona (yellow labels 5, 7 and 8 marked "prob. undescribed," Wism., 1886); Oracle, Arizona, July 8, 10, 12, 16 and 24 (E. A. Schwarz); Fort Grant, Arizona, July 19, 20 and 22 (H. G. Hubbard); Tucson, Arizona, July 21 (E. A. Schwarz); Chiricahua Mts., Arizona, July 4 (H. G. Hubbard); Mesilla Park, New Mexico, July 8 and Aug. 13 (T. D. A. Cockerell); Texas (coll. Beutenmüller); Sharpsburg, Texas, May 11 (E. A. Schwarz); Glenwood Springs, Colorado (W. Barnes); Nevada.

Genus PSEUDANAPHORA, Walsingham.

Wals., Trans. Ent. Soc., Lond., 1887, 170; *Eutheca*, Grote, Bull. Geog. Surv. Terr., VI., 257, 1881; Dyar, CAN. ENT., XXVII., 15, 1895; *Sapinella*, Kirby, Cat. Lep. Het., 524, 1892.

Synopsis of Species.

Uncus single, long and slender.....*Davisellus*.

Uncus double, two spines projecting from a rounded plate....*arcanella*.

Pseudanaphora Davisellus, Beutenmüller.

Beut., Ent. Amer., III., 139, 1887.

Though described as an Acrolophus, this is obviously referable to *Pseudanaphora*, from the short erect palpi.

Arizona (Beutenmüller's type); Fort Grant, Arizona, July 20 (H. G. Hubbard).

Pseudanaphora arcanella, Clemens.

Clem., Proc. Acad. Nat. Sci., Phil., 1859, 262; Wals., Trans. Ent. Soc., Lond., 1887, 170 (references); Beut., Ent. Amer., IV., 29, 1888; Forbes, 16th Rept., Ill., 98, 1890; *mora*, Grote, Bull. U. S. Geol. Surv., VI., 257, 1881; Kirby, Cat. Lep. Het., 524, 1892; Dyar, CAN. ENT., XXVII., 15, 1895.

Rhinebeck, New York (Dyar); Rhinebeck, N. Y., July 5 (Miss L. J. Hoff); Fordham, N. Y. (G. Gade); Staten Island, N. Y., June 25 and July 16 (coll. Beutenmüller); District of Columbia, July 18 (coll. C. V. Riley); Washington, D. C., October 10 (A. Busck); St. Louis, Missouri, issued July 3 (C. V. Riley, breeding No. 2563); Texas (coll. Beutenmüller). The specimen taken in October is very dark in colour, blackish, the markings being only faintly indicated.

NEW COCCIDÆ FROM CALIFORNIA.

BY EDW. M. EHRHORN, MOUNTAIN VIEW, CAL.

Xylococcus quercus, n. sp. (Plate 7, figs. 1 and 2.)

Egg quite large, of a light orange colour.

Young larvæ dark orange-red, active, body broadly oval, about $\frac{2}{3}$ mm. long. Legs and antennæ light brown, well developed. Antennæ short, 6-jointed. Joint 1 stoutest, joint 6 longest, and joint 4 shortest. Formula: 651234. Joints 2 and 5 with three bristles. Joint 6 with numerous long stout bristles. Legs moderately long, with femur quite swollen. Tarsus longer than tibia. Digitules of tarsus fine hairs; those of claw long stout clubs curved upwards. Each segment of abdomen bears a backward directed short stout spine. On each side of anal tube is a long fine bristle. Anal tube large, with numerous stout spines. Stigmatal tubes well developed.

♀ second stage, body crimson, shiny, nearly spherical, about $1\frac{1}{2}$ mm. long, 1 mm. broad, surrounded by cottony and waxy secretion. Antennæ and legs wanting. Anal tube well developed, producing a glassy rod, like a stout white hair, rather brittle. Last segment of body dark brown. When cleared in K. H. O., surface of body finely granulated, more so near caudal end. Stigmatal tubes are large and well defined. There are numerous spines and gland openings scattered over the body.

♀ third and fourth stages very similar to second stage, but larger in each case from the preceding, and varying in the further development of stigmatal and anal tubes, glands, spines, etc.

Adult ♀ head, thorax, legs and antennæ reddish-brown, abdomen blackish-brown, segmentation distinct. There is a distinct constriction between the thorax and abdomen. Length of body about $5\frac{1}{2}$ mm., breadth $2\frac{1}{2}$ mm., quite convex above. Ventral side of abdomen concave, with revolute margins. Insect quite active. When ready to

deposit eggs crawls into some crevice and produces a cottony cushion on which it rests and secretes considerable white cotton over its entire body. Antennæ 9-jointed. Joint 1 longest and broadest, next in length is 2, then joint 9 and then 3. Joints 4, 5, 6, 7 and 8 are subequal, and are a little shorter than 3. Formula: 129345678. Legs long and stout. Tibia twice as long as tarsus, both very hairy. Claw long and stout. Digitules fine hairs. Body sparsely covered with long stout spines, especially along the margin and caudal end. Stigmatal tubes very prominent. Anal opening simple and quite large.

♂ larva much like that of ♀, but narrower and more oblong.

♂ second stage not observed.

♂ third stage like that of ♀, but smaller and more elongated.

♂ fourth stage (cast skin) without rostrum. Antennæ 9-jointed. Joints 1 and 9 longest and subequal; joints 7 and 8 subequal; joints 4 and 6 subequal; and joints 2 and 5 subequal. Each joint with long stout hairs. Joint 9 rounded at tip, with several stout hairs and spines. Formula: (19)(78)3(46)(25). Legs long and very stout. Femur much swollen, very little shorter than tibia. Tarsus $\frac{1}{2}$ of tibia. Claw stout and curved. Digitules simple hairs. Body covered with long fine hairs. There are several stout spines on caudal end of abdomen.

♂ pupa, about $2\frac{1}{2}$ mm. long and 1 mm. broad, enveloped in a densely-woven cottony sac about 5 mm. long and 2 mm. broad. Thorax, legs and antennæ light yellow, abdomen crimson. Wing-pads very broad. Legs long and stout. Tarsus $\frac{1}{2}$ as long as tibia. Femur stout and as long as tibia. No claw. Antennæ 9-jointed. Joint 1 stoutest. All joints annulated with white and subequal. Formula: 3.(2.9)4.5.6.7(18).

Adult ♂ about 3 mm. long and $1\frac{1}{2}$ mm. broad, slightly pubescent. Colour of abdomen reddish-brown. Mesothorax black, with four raised knobs. Front part of head black, eyes very prominent, strongly faceted, black. Legs and antennæ black and very hairy. Ventral surface of abdomen dark brown, segmentation distinct. Mesosternum black, a small black line on prosternum, and an irregular black patch on metasternum. Abdominal brushes with long stout glassy bristles about 6 mm. long. Style short, stout and conical. Antennæ 10-jointed, very hairy, reaching beyond end of abdomen. Joint 2 shortest, joints 3 and 10 a little longer, and the other joints subequal. Each joint with numerous hairs. Wings large, about 3 mm. long and 1 mm. broad, expanse about

7 mm., smoky, slightly pubescent, with the costal space blackish-brown. Halteres resembling small wings with several hooks. Legs long, stout and very hairy. Femur much shorter than tibia. Tibia about four times as long as tarsus. Digitules fine hairs. Claw long, slender and well curved. Digitules short club-shaped hairs.

Hab.—I found this remarkable insect in May, 1899, on *Quercus chrysolepis* in Stevens Creek Canon, near Mountain View, Cal., and patiently collected the different stages during the year.

Phenacoccus artemisiæ, n. sp. (Plate 7, fig. 3.)

Adult ♀ elongate oval, about 3 mm. long and $1\frac{1}{2}$ mm. broad, of a sage-green colour. Measuring with egg sac $4\frac{1}{2}$ mm. Sac loosely woven without any grooves, eggs lemon-yellow. Legs and antennæ light brown. Body thinly covered with secretion, but not enough to hide colour of body. Segmentation distinct. When placed in boiling K. H. O., body turns orange colour, and leaves derm colourless after boiling. Antennæ 9-jointed. Joint 2 always longest, joints 5, 6, 7, 8 subequal. Formula: 23914(5678). Joints 1, 7, 8 and 9 with several stout hairs. Legs short and stout. Femur about as long as tibia. Tibia twice as long as tarsus. Claw stout and long, with tooth. Digitules fine knobbed hairs.

Adult ♂.—Abdomen yellowish-green, thorax and head dark green. Thorax marked with black longitudinal lines. Body slightly pruinose. Antennæ and legs light brown. Eyes dark red. Wings more or less pruinose, very delicate. Antennæ very hairy; 10-jointed. Joint 3 longest, joint 1 shortest and stoutest, joints 7, 8 and 10 subequal, joints 2 and 9 subequal. Formula: 3.4 5.6.(7.8.10)(2.9)1. Legs very hairy, long and slender. Tibia much longer than femur. Tarsus very short, less than $\frac{1}{3}$ of tibia. Claw long and very slender. Digitules fine hairs.

Hab.—On *Artemisia Californica*. Stevens Creek Canon, near Mountain View, Cal. August 22, 1899.

Phenacoccus stachyos, n. sp. (Plate 7, fig. 4.)

Adult ♀ about $2\frac{1}{2}$ mm. long and 1 mm. broad, convex, tapering posteriorly, viviparous, of a sage-green colour. Slightly covered with white secretion, which, when seen through lens, appears as minute white dots. Segmentation distinct. There are two longitudinal rows of light brown dots on the meson. The dorsum and margin are thickly set with long fine iridescent spines, which are deciduous. Legs and antennæ light brown, quite hairy. Caudal filaments short and stout. When placed in

boiling K. H. O., body turns reddish-brown. After boiling, derm becomes colourless, antennæ, mouth-parts and legs remaining light brown. Antennæ long and slender, each joint with a few long fine hairs. Joint 3 longest, next comes joint 2, joints 4 and 5 subequal, joints 1 and 6 subequal, joint 8 shortest. Formula, approximately: 32(45)9(16)78. Legs long and stout, quite hairy. Trochanter with very long bristle. Femur a trifle shorter than tibia. Tarsus about $\frac{1}{3}$ of tibia. Claw long and slender, with tooth. Digitules fine knobbed hairs. Lobes well developed, with a long seta, and two long fine bristles. Anal ring with six stout hairs. On each segment of the ventral surface, thorax, and on the head, there are numerous very long fine hairs, and there are numerous short fine spines and numerous spinnerets with club-shaped tubes scattered over the body. Newly-hatched larvæ orange colour, elongate oval. Antennæ 6-jointed, quite stout. Joint 6 longest, twice as long as 4 + 5; joints 1 and 2 subequal, joints 4 and 5 subequal. Formula: 63(12)(45). Legs short and stout. Tarsus as long as tibia. Rostral loup extending beyond last coxæ. Caudal lobes and setæ quite prominent.

Hab.—On *Stachys bullata*. San Francisquito Canon, near Mayfield, Cal. June 28, 1899.

Phenacoccus bahie, n. sp. (Plate 7, fig. 5.)

Adult ♀ about 4 mm. long and 3 mm. broad, covered with white cottony secretion, with a distinct ridge of cottony tufts running longitudinally on the meson and two smaller ridges parallel with it. Each ridge has a large tuft at the cephalic end. Margin fringed with short broad cottony appendages, getting longer towards caudal end. Legs and antennæ dark brown. Colour of body is greenish-yellow, with a brown patch on the meson. When boiled in K. H. O., turns crimson at first, then derm becomes colourless, except a row of dark brown patches on the body near and running parallel with the margin. These grow larger caudad. Body is densely covered with round glands and stout conical spines. Anal ring large, with six long stout hairs and numerous stout hairs scattered over area surrounding it. Antennæ and legs remain brown. Antennæ 9-jointed, long and stout. Joint 3 generally longest, then 5, then 9. Joints 1, 2 and 8 generally shortest. All joints quite hairy, and joint 9 quite pointed, with numerous hairs. Formula, approximately: 3.5.9.6.7.4.8.1.2. Legs very long, stout, and thickly covered with very stout hairs. Femur and tibia subequal. Tarsus about

$\frac{1}{3}$ tibia. Claw very stout and curved, with tooth. Digitules very long fine hairs.

Immature ♂ much like ♀, smaller and lighter colour, about $2\frac{1}{2}$ mm. long, $1\frac{1}{2}$ mm. broad. Legs not as stout. Antennæ 7-jointed. Formula: 372(1456).

Sac of ♂ snow white, more or less irregular in shape, no distinct carinæ, about 4 mm. long, 2 mm. broad.

Pupa.—When removed from sac, cylindrical, shiny. Outline of antennæ, wing-pads and segmentation distinct. Body more or less pitted. Colour greenish-brown, about $2\frac{1}{2}$ mm. long, $1\frac{1}{2}$ mm. broad. Turns dark red when placed in K. H. O.

Adult ♂ measuring, without setæ, about 3 mm. long and 1 mm. broad. Setæ are about twice as long as body, of a snow-white colour. Head and thorax dark brown, abdomen greenish-yellow, slightly covered with white secretion. Head and thorax with numerous stout hairs, abdomen thickly covered with stout hairs. Antennæ very long, stout and very bristly, 10-jointed. Joint 2 shortest, very little shorter than 1. These two joints are about as broad as long, the rest of the joints are sausage-shaped. Joints 3, 4 and 5 subequal and longest. Formula: (3.4.5)6.7.8.9.10.1.2. Legs very long and stout and very hairy. Coxa and trochanter short, latter with very long stout spine. Femur one-fifth shorter than tibia, tarsus $\frac{1}{2}$ of femur. Claw stout, curved, with tooth and double spur. Digitules stout hairs extending as far as tooth. Tarsal digitules fine hairs extending to end of claw. Wings dusky, pubescent, each about $2\frac{1}{2}$ mm. long by 1 mm. broad. Halteres comparatively small, with two stout, well-curved hooks. Style long, stout and conical, forming a blunt hook at caudal end. The last abdominal segment has two groups of round gland openings; on the cephalic margin of each two very long stout spines arise, which run parallel caudad. There are also numerous stout hairs surrounding the glands.

Hab.—On *Bahia*, sp., in foothills near Mayfield, Santa Clara County, Cal. May 7th, 1899.

Dactylopius quercus, n. sp. (Plate 7, fig. 6.)

♀ slightly covered with white secretion, about $2\frac{1}{2}$ mm. long and $1\frac{1}{2}$ mm. broad, tapering at both ends. Colour of body greenish-brown, concealed more or less by secretion. Segmentation very distinct. Each segment bears a white filament on the margin. Caudal setæ about $\frac{1}{3}$ as long as body, white and quite stout. Antennæ and legs dark brown.

When placed in boiling K. H. O., body turns crimson, derm becomes colourless after boiling. Antennæ 8-jointed. Joint 8 longest, joint 7 generally shortest. Formula, approximately: 832(15)647. Each joint has a ring of stout hairs. Joint 8 has numerous very long hairs. Legs long and stout, with numerous long fine hairs. Femur about as long as tibia; tarsus about a third as long as tibia; claw slender and well curved. Digitules long fine knobbed hairs. Anal ring small, with six fine hairs. Caudal lobes well developed, with very long setæ (280 μ). Groups of spinnerets, conical spines and long slender hairs scattered over the dorsum.

Hab.—On *Quercus chrysolepis*, on the leaves and in cracks of bark. May, 1899. Stevens Creek Canon, near Mountain View, Cal.

Dactylopius maritimus, n. sp. (Plate 7, fig. 7.)

♀ elongate oval, about 2 mm. long and 1 mm. broad, flattish, slightly covered with secretion. Colour of body, reddish-brown. Margin beset with stout, short, white filaments, which grow longer caudad. Caudal setæ about $\frac{1}{2}$ length of body. Legs and antennæ same colour as body. Eggs orange-yellow. Egg sac well developed and has the appearance of *Pulvinaria camellicola*, but smaller—about 5 mm. long and 2 mm. broad.

Young larvæ light orange-yellow.

When boiled in K. H. O., ♀ turns liquid purple and derm becomes colourless. Body thickly beset with long slender spines and many round glands. Each segment has a group of spinnerets on its margin, in the centre of which are two short stout conical spines. Antennæ 8-jointed, quite hairy. Joint 8 always longest, and joint 4 generally shortest, although joint 6 sometimes is shorter than 4; again, joints 4 and 6 are sometimes equal.

The following formulæ will assist in determining the species:

82(13)(57)64.

82(13)5(47)6.

8321(57)64.

81(23)57(46).

Legs quite hairy, well developed, long and slender. Trochanter with long stout spine (128 μ). Femur about as long as tibia. Tarsus about a third as long as tibia. Claw short and stout. Digitules fine knobbed hairs. Caudal lobes prominent, with moderately long setæ and two very stout conical spines. Anal ring large, with 6 very long stout hairs.

Hab.—On *Eriogonum latifolium* roots on the cliffs at Santa Cruz, Cal. July, 1899.

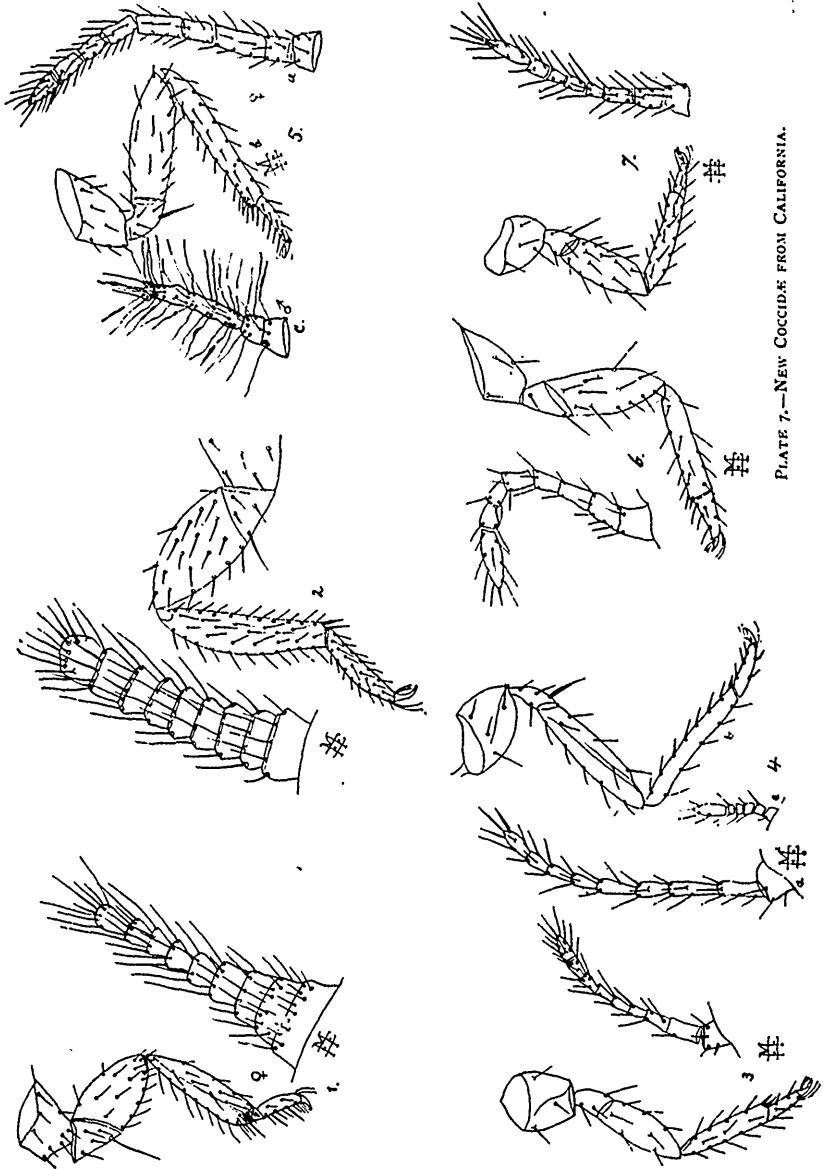


PLATE 7.—NEW COCCIDAE FROM CALIFORNIA.

EXPLANATION OF PLATE 7.

- Fig. 1.—*Xylococcus quercus*: adult ♀ antenna and leg.
 Fig. 2.—*Xylo. quercus*: ♂ fourth stage antenna and leg.
 Fig. 3.—*Phenacoccus artemisiæ*: adult ♀ antenna and leg.
 Fig. 4.—*P. stachyos*: a, antenna; b, leg of adult ♀; c, antenna of larva.
 Fig. 5.—*P. bahiæ*: a, antenna; b, leg of adult ♀; c, first 3 joints of antenna of ♂.
 Fig. 6.—*Dactylopius quercus*: adult ♀ antenna and leg.
 Fig. 7.—*D. maritimus*: adult ♀ antenna and leg.

A QUESTION OF NOMENCLATURE.

The status of Professor French's *Gastrophilus epilepsalis*, described in the September number of this journal, has interested me especially, as I am preparing a new catalogue of North American Diptera.

I am convinced that it was decidedly premature to assign a specific name to this larva. In the first place, it was very small and immature, and the earlier larval forms of Oestridæ are much less known than the later, so that we do not possess the data that would enable us to separate this species, for instance, from *G. nasalis*. In fact, I do not think Professor French's description sufficient for the recognition of the same stage of the larva at all, unless the specimens were known to have come from a person affected with epilepsy. It must be remembered that there is every reason to assume the normal habitat of this species of fly to be in some other mammal. Its occurrence in man is in the highest degree unusual. Is it not hopeless, then, to anticipate that specimens taken from their normal host at some future time will be correctly associated with this species? And if such a thing could be, would there not be an incongruity in the name *epilepsalis*?

The name does not deserve a place in a catalogue, unless in a footnote.

J. M. ALDRICH.

Moscow, Ida., September 6.

SUDDEN DISAPPEARANCE OF THE PURSLANE SAWFLY,
SCHIZOCERUS ZABRISKEI.

BY F. M. WEBSTER, WOOSTER, OHIO.

On page 54 of the current volume of the CANADIAN ENTOMOLOGIST, I called attention to the sudden and almost total disappearance of this

species at Wooster, Ohio, where it had for several years been excessively abundant, even up to the latter part of August and early September of last year, 1899. This abrupt termination of the period of activity was at the time attributed to the effect of a parasitic species, *Ichneutes*, sp. ?, which had in the meantime become also excessively abundant.

Although the purslane has grown luxuriantly and is unusually abundant this year, so much so that gardeners are complaining bitterly of its abundance and vigour, up to September but a single female *Schizocerus* has been observed, and but a single instance of the work of the larvæ noted, though the writer has searched most carefully for both during the entire season. In fact, it was hoped this year that the full life-history of the species might be carefully gone over again and completely studied, but this has unexpectedly been rendered impossible.

BOOK NOTICE.

THE ARGYNNIDS OF NORTH AMERICA.—To Mr. Arthur J. Snyder we are indebted for a paper published in the Occasional Memoirs of the Chicago Entomological Society, Vol. I., No. 1, 1900, on the much-vexed question of the Argynnis of North America.

The author follows Doubleday, Westwood, Edwards, Elwes and others in rejecting the division of the group, made by some systematists, into the two genera, Argynnis and Brenthis, as he considers this division based on "hair-splitting distinctions." In referring to the range of the genus, he is not quite correct in saying that the group is wholly unrepresented in the tropics, as one species, *A. Hanningtoni*, was collected near Mount Kilimanjaro, in tropical Africa, by the lamented Bishop Hannington, and was dedicated to his memory by Mr. Elwes.

The author states that he "has on several occasions taken the sexes of different species *in coitu*, and from personal observations satisfied himself that the Argynnis are polygamous in their habits," and a little further down he says, "Artonis and Eurynome cohabit, also Eurynome and Clio. The same is undoubtedly true of several other species."

Surely this is a railing accusation to bring against these unfortunate creatures who have never had it explained to them that they are really different species and should behave as such, and certainly shows a sublime faith in the infallibility of the authors who have named these forms as distinct to which the reviewer, possibly because he was born on St. Thomas's day, has never been able to attain.

Probably the facts which Mr. Snyder has observed would suggest to most field naturalists that these slightly differing forms were really only varieties of one species rather than that this particular group of butterflies had lost all sense of decency and propriety, which would be especially shocking in view of one of their number having been named after a bishop, and apparently our author was led to this conclusion in regard to some, at least, of the supposed libertines, as will presently appear.

Mr. Snyder states his opinion that dimorphism occurs among the Argynnids, and believes "that at least two of our so-called species are in reality dimorphic males of species previously described," but he does not give the names of these species, which are all males.

The author thinks that a thorough exploration of the territories where these disputed forms occur will result in revelations that will startle those who have hastily named new species, but is it not a counsel of perfection to urge the student of Argynnids "to secure a large series of species from every locality," for is not every few miles in every direction a separate locality?

Mr. Snyder reduces the number of supposed species from 64 to 57, and increases the number of supposed varieties from 10 to 15, but the only names which he strikes out of the list are *Macaria*, which he states is a synonym of *Eurynome*, and *Opis*, as a synonym of *Clio*.

Cipris and *Alcestis* are placed as varieties of *Aphrodite* and *Bischoffi*; *Artonis* and *Clio* are finally referred as forms of *Eurynome*.

Arge is listed as distinct, but is said to intergrade with *Eurynome*.

Electa is erroneously given as *Electra*.

Mr. Snyder groups the forms in six groups, which he designates as follows:

Diana group, *Monticola* group, *Edwardsii* group, *Semiramis* group, *Eurynome* group, and *Myrina* group, the latter embracing all those which have been placed in the genus *Brenthis*, along with *Astarte*, *Doub.-Hew.*

This grouping is followed by notes on the individual forms, but the whole paper shows that much more knowledge is needed before a really satisfactory revision of the very difficult North American forms can be made.

H. H. L.