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FOURTH ANNUAL MEETING OF THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

The fourth annual meeting was held in the University building, Rochester, N. Y., on Monday and Tuesday, August 15th and 16th, the President, Dr. J. A. Lintner, of Albany, N. Y., occupied the chair and Prof. F. M. Webster, of Wooster, Ohio, filled the office o. Secretary. The following members were also present:—C. V. Riley and L. O. Howard, Washington, D. C.; D. S. Kellicott, Ohio; John B. Smith, New Jersey; E. B. Southwick, New York; H. E. Weed, Mississippi; M. V. Slingerland, New York; H. Osborn, Iowa; J. Fletcher and C. J. S. Bethune, Ontario; C. H. Perkins, Vermont; P. H. Rolfs, Florida; S. A. Forbes, Illinois.

Owing to the ill-health of the President, the annual address was delivered by the Vice-President, Prof. Forbes, in which he treated especially of the work that has recently been done on the contagious diseases of insects, and the satisfactory results that have thus far been obtained. He also referred to the successful importation of several insect parasites, and drew the attention of the meeting to the desirability and importance of studying the aquatic insects of America and their relations to fish culture. This able and highly interesting address was subsequently reported upon by a special committee who warmly commended it, and urged upon the attention of economic entomologists the recommendations in regard to "Aquatic Entomology" and its bearings upon fish culture.

Prof. Kellicott read a paper upon "Hypoderus Columbæ", a mite which is parasitic upon pigeons.

A paper by Mr. C. H. Tyler Townsend was read on "The possible and actual influence of irrigation on insect injury in New Mexico", in which he showed that in that region of the country irrigation may be made to exert a valuable influence as an adjunct to the proper use of arsenites and kerosene.

Prof. Kellicott read "Notes on Ægeriadæ of Central Ohio, No. II.", which is published in full.

Prof. Smith said that adults of the Squash borer, *M. ceto*, from last year's larvæ were now flying on Long Island, and that all stages of the insect might be obtained in the same field. The moths gather in the evening on the upper sides of the leaves, and are collected in great numbers by the farmers. Messrs. Forbes, Slingerland and Smith stated that in their experience the Ægerians were not attracted by electric light.

A paper on "The Bean Weevil, *Bruchus obsoletus*", was read by Mr. V. Slingerland, in which he described the mode of ovipositing, and gave a brief account of the life history of the insect. He stated that bisulphide of carbon will destroy the insect in all stages. He also read a paper on "*Drasteria erechtea*", in which he stated that in 1889 over two thousand specimens were taken by means of trap lanterns at Ithaca, N. Y. Last year he bred a number of specimens, and as a result of the study of the material thus obtained, together with about three hundred specimens sent him from all sections of the country, he came to the conclusion that there are two species, about equally common, included under the name *erechtea*, and that these should be called *D. erechtea*, Cram., and *D. crassiuscula*, Haworth, with *ochrea* and *distincta* as varieties of the latter. He then proceeded to describe the differences between the species, and recommended the plowing of infested fields in order to destroy the larvæ and pupæ.

A paper by Mr. T. D. A. Cockerell, of Kingston, Jamaica, on "*Orthezia insignis* as a garden pest", was read by the Secretary. The writer stated that the insect was first observed on a variety of exotic plants in the hot houses at Kew and elsewhere, and that he now found it injurious to several garden plants in Jamaica.

A paper by Dr. F. W. Goding on "The Food Plants of North American Membracidæ" was next read. This was followed by Prof. J. B. Smith's paper: "Notes of the Year in New Jersey", in which he referred to the principal insect attacks that had come under his notice. In the discussion that followed remarks were made by Mr. L. O. Howard, Prof. H. Osborn, Dr. Lintner, and Prof. F. M. Webster.

Mr. Webster drew attention to the occurrence of *Phytonomus punctatus* to an injurious extent in North Eastern Ohio, and of *Hylastes trifolii*

attacking peas in Northern Ohio. He stated further that *Otiorhyncus ovatus* was found feeding upon the foliage of musk melons.

A paper on "Two Serious Pear-tree Pests" was read by M. V. Slingerland, of Cornell University.

1 The Pear-tree Psylla *(Psylla pyricola).*—This insect is described as one of the most serious pests that pear growers have to fear. It had appeared in the valley of the Hudson in enormous numbers during 1891, orchards which had given promise of 1,200 barrels of fruit having perfected less than one hundred barrels. The Pear-tree Psylla, when mature, is scarcely 3 mm. in length, and shaped like a miniature Cicada. The nymphs are oval and very flat, and produce a great deal of honey-dew, which renders the trees unsightly. There are three and perhaps four broods in the year, and it is in the perfect state that the insect hibernates. As a remedy Mr. Slingerland had found that the nymphs were easily destroyed by a very weak kerosene emulsion (two per cent.) Washing the trees in winter to destroy the adults was also recommended.

2. The Pear-leaf Blister mite *(Phytoptus pyri)*, was alarmingly on the increase in the United States and Canada. It is a very small mite, which hibernates beneath the bud scales of the pear tree, and comes out when the leaves expand in spring and forms blister-like galls on the foliage. Spraying the trees during the winter with kerosene emulsion had been found successful.

Prof. Lintner stated that *P. pyri* was very abundant in Eastern New York.

Prof. F. M. Webster had also found it abundant in Ohio. Spraying with Bordeaux mixture had shown no effects in reducing the leaf-blisters.

Prof. J. B. Smith had found that in orchards sprayed with the ammoniacal solution of carbonate of copper, mixed with London purple, the pest was perceptibly lessened.

Mr. Southwick read a paper upon *Depressaria heracleana*, the Parsnip web worm, and gave an interesting account of the war waged upon it by the "Potter Wasp", *Eumenes fraterna*, and stated that he had bred from it a Hymenopterous parasite, a species of *Limneria*.

Mr. Howard read a paper, "An Experiment against Mosquitoes," which was listened to with great interest. A small quantity of coal oil was distributed over the surface of a small mountain lake, and enormous numbers of the larvæ and perfect insects were destroyed.

Interesting notes of the year were read from Mississippi by Prof. Howard Evarts Weed.

With regard to the Horn Fly, Prof. Smith stated that it was not more abundant in New Jersey than the ordinary cattle fly *(Stomoxys calcitrans)*.

Prof. Kellicott said that his son had found it very abundant in Central Michigan.

Mr. Weed thought that dark coloured cattle were most subject to attack. He also recorded that the insect now occured in Louisiana.

Dr. Bethune stated that the Horn Fly had this month been noticed for the first time in the Province of Ontario at Oshawa, Toronto and London, and was creating some alarm among stock owners.

Mr. P. H. Rolfs had found the Horn Fly in Florida.

Mr. Osborn read Notes on Injurious Insects in Iowa. For want of time the discussion on this interesting paper was deferred.

Prof. C. V. Riley read a paper on Rose Saw-flies, in which it was shown that there were three distinct species attacking roses.

AFTERNOON SESSION.

On reassembling the following members were elected:—Prof. P. H. Rolfs, of Florida; Mr. H. A. Gossard, of Iowa, and Mr. C. F. Baker, of Colorado.

A paper on Plant Faunæ by Mr. T. D. A. Cockerell, of Kingston, Jamaica, was read.

Mr. James Fletcher read a paper on Injurious Insects of the year in Canada. This gave rise to a long and interesting discussion on several points brought up in the paper, particularly with regard to the life history of *Gortyna immanis*, the different kinds of Knapsack sprayers, and the most practical remedies for the Horn Fly.

Prof. Webster read a paper on the Aphidivorous Habits of the Common Slug *(Limax campestris)*, which was discussed by Messrs. Riley, Smith and Howard.

Dr. Bethune had found slugs upon trees he had sugared for moths.

The following officers were elected for the ensuing year:—President, Prof. S. A. Forbes, of Illinois; 1st Vice President, Dr. C. J. S. Bethune, of Canada; 2nd Vice-President, Dr. J. B. Smith, of New Jersey; Secretary, Prof. H. Garman, of Kentucky.

The meeting then adjourned.

NOTES ON AEGERIADÆ OF CENTRAL OHIO—II.

BY D. S. KELLICOTT, COLUMBUS, OHIO.

The first collection of notes on the Aegeriadæ of Central Ohio was published in the current volume of the CANADIAN ENTOMOLOGIST. Since the former notes left my hands additional observations have been made, and a few more species collected. Inasmuch as I shall have something to say of the destructive habits of the larvæ of these species, this seems to be the appropriate place to present these notes.

Melittia ceto, West.—Concerning this species, in view of the facts cited, I said in the former paper, "It seems in view of the facts at hand that in Central Ohio and South it is double brooded." In the May number of the CANADIAN ENTOMOLOGIST, Prof. J. B. Smith has an interesting note throwing light upon this question. His quotation from the MS drawings by Abbott clearly proves that in Georgia it has two annual broods He also cites the facts of his own observations in New Jersey, and expresses his disagreement with my inference for the latitude of Central Ohio. He may be right; I am simply waiting to see. I still think there is something in its life-history not yet explained.

Larvæ put into breeding cages in September last gave imagos in May and June. Larvæ were found destroying the squash plants early in July; by the 15th to 20th I transferred the plants to breeding cages, with larvæ of different sizes. These shall be carefully watched, and the result reported.*

Sciapteron tricincta, Harris.—This species was reared by me several years since at Buffalo, N.Y., from enlargements of the branches and stems of *Populus candicans* and *Salix* caused by the larvæ of *Saperda moesta* and *Saperda concolor*. The present season I have found it at Columbus, with similar habits, in the stems of the willow injured and enlarged

*NOTE, AUG. 8.—By August 1st a few larvæ had left the stems and entered the ground; by the 8th, the day of last examination, many had done so. Small ones are comparatively few. Among the smaller ones there was an abundance of that second form described by Prof. Scudder, in Psyche, Vol IV., p. 303. Some of these were isolated, and after a few days they moulted, giving the typical form. This seems to prove that there is but one species. It may be interesting to note that these larvæ will feed in the stems and roots of *Echinocystis lobata*; also in the fruit of the musk melon. I have not watched them to maturity in either.

NOTE 2, AUGUST 26.—On my return to Columbus, August 25, I found that three examples of the imago had emerged in the vivarium from the larvæ placed therein between July 15 and August 1. My son had noted the dates of appearance, as follows:—One each on the 20th, 21st and 23rd; to-day a fourth emerged, and three fresh ones were captured in the field. These facts I consider sufficient to prove that in Central Ohio there may be a second brood.

by the larva of *S. concolor*. The beetles appeared from the middle of May to the middle of June; the female gnaws deeply through the bark into the wood, generally near a branch, and places an egg at the bottom of each pit; the larva is soon burrowing under the bark and into the wood; there are often several at the same point. The Aegerians appear later in June and July and place their eggs in the excrescenses caused by the boring young of the beetle. I have not yet found instances in which it was clearly apparent that the young Sciapteron had made its own way into uninjured stems. This fine moth is seldom seen on the wing, but is easily obtained by gathering the stems infested by *Saperda* in May and keeping them moist for a few weeks.

Aegeria corni, Hy. Edw.—The trunks of the maples at Columbus are greatly disfigured by the larvæ of *Aegeria acerni*. The branches also suffer to a large extent by the action of another aegerid infesting them. The former pest is confined almost wholly to the trunks of shade trees; the latter occurs in both shade and forest trees—most numerously in the latter or perhaps in isolated trees in the fields.

The branches ranging from mere twigs to those an inch or two in diameter are found much enlarged, often at several different points, into rough barked and gnarled excrescences; these are often nearly globular, more often, however, oblong, and frequently there are openings into the centre of the stem. On cutting into the wood it is found to be mined in various directions and decaying; this often causes the branch to die or so weakens it that the winds throw it down. There may be one or more larvæ in a single excrescence.

The mature larvæ are 12 to 15 mm. long; body slender, white; the skin is transversely folded, especially in the thoracic rings, and there is a strong longitudinal substigmatal fold. The head is smooth, pale brown, with the anterior edge of the clypeus, labium and mandibles black; the thoracic shield smooth, broad and colourless; feet pale yellow; stigmata small, round, pale yellow; piliferous spots scarcely perceptible; fine, short hairs chestnut.

The larva changes to pupa in a thick, gummy cocoon, strengthened exteriorly by bits of wood and placed in cells just under the bark, with a thin shell remaining to be broken up by the pupa at the final change, the pupa skin remaining protruded.

The pupa measures 10 mm., slender, light brown, with the usual transverse denticles on the dorsal abdominal segments and a circle of

stouter teeth about the abdominal tip; the clypeus is armed with spine or tooth.

The moths issued this year from May 11 to July 15. It is a pretty species, the sexes differing somewhat in appearance, the female being easily mistaken for that of *acerni*, although smaller.

The male expands 17 mm.; the colour deep black with some metallic scales; the narrow clothed margins of the wings and heavy discal bar deeper than the apical patch which is more bronze-brown; fringes concolorous except the anterior third of inner margin which is yellow. Clypeus with white lateral lines; palpi light orange except the blackish third joint and outer side of second apically; collar same colour as palpi; antennæ black, slightly washed with white on outer edge of apical third. The thorax yellow below, black above, with long golden cilia about the insertion of the wings. Abdomen black above, same below, with more or less of golden scales running up on the sides at edges of rings, and on fourth ring giving a narrow band, in some seen faintly on other dorsal rings. Anal tuft ample, black above and laterally at base, below deep reddish orange. Claspers yellow. Legs: coxæ golden, other joints black outwardly, golden inwardly to claws, last pair with middle of tibia and tips of tasal joints ringed with golden; the inner side of fore tibiæ is light orange; spurs concolorous with the golden yellow legs.

The female expands 20 mm. General colour the same as male, but differs in having less black at tips of palpi, in having much more golden beneath abdomen, in having the same extending over dorsum so that nearly all the rings are faintly edged. and the fourth with a broad band, and in having no black in the ample caudal tuft which is deep reddish-orange.

I have compared the moth with Henry Edwards's description of *Aegeria* and conclude it is his *Aegeria corni*, although one cannot be positive without comparing the type. He had before him only one male taken in Purgatory Swamp, Mass., and the description is not all that could be wished. My specimens differ slightly from the description and vary considerably, frequently more than some of Mr. Edwards's species differ from one another. I will point out some differences which it seems to me are easily reconciled. He gives expanse of *corni* 15 mm.; the smallest of mine (males) is 15 mm., the largest 18 mm., average 17 mm. He says, "No bands." Some of mine are scarcely banded after storage in the cabinet a month. He says "spurs light orange." In mine they are not, the only real difference between his descriptions and my moths.

Before our next annual meeting I shall try to compare my moths with the type, and shall take pleasure in reporting the results.

Is the moth an inquiline? It would seem so, yet after much searching I have found only one beetle borer that would probably serve as a forerunner; this was found in an excrescence of *Acer dasycarpum*. The Aegerian is far more abundant in *Acer saccharinum*.

Aegeria rubristigma, n. s.—Whilst searching in excrescences on the oak for examples of *Aegeria gallivora*, I came upon the present species,

which is less common than *gallivora;* it is a perfectly distinct species and apparently undescribed; hence I propose to describe it under the name given above. One male and one female obtained. Female.—Fore-wings purple black, with red scales between the veins and the square stigma at end of cell red; borders of hindwings very narrow, costa reddish; fringes ample, black, yellow at basal third of inner margin of hind pair; beneath forewings yellow to stigma, which is deep orange, beyond the borders and veins black with reddish between; hindwings with costa yellow, also anterior third of inner margin. Head all blue-black, with milk-white lines before the eyes; collar yellow; palpi with basal joint black, second black except the front margin, which is yellow, as is the whole of the third joint; the antennæ are wholly black, except the under side of the basal ring which is yellow. Thorax uniform blue-black, with colour extending upon the base of wings, metathorax golden yellow; beneath colour as above, with a light yellow almost white spot under the insertion of the wings. Abdomen concolorous with thorax above and below; the second segment has a narrow dorsal band, the fourth a wide one, extending entirely around the body, and the last a narrow band all golden-yellow; tuft at end of abdomen concolorous above and below with a line of yellow hairs laterally. Legs blue-black, varied as follows: Fore-coxæ outwardly, fore-tibiæ, all the tarsi, the spurs and a band at the middle and apex of the hind tibiæ yellow; the tarsi, however, have some dark, scales sometimes appearing faintly banded.

The male agrees with the foregoing except that the abdominal bands are less distinct and the yellow in the caudal is wanting.

Expands 17 mm.

Obtained from Cynips gall on twigs of *Quercus palustris,* collected by my friend, E. E. Bogue, at Sugar Grove, Ohio, and by myself at Central College, Ohio. One imago appeared June 10 and one July 15.

The pupa has the usual form, length 12 mm., armed, clypeal spine flattened to a cutting edge apically; there is a median ridge on the dorsum of mesothorax and on either side of it a parallel grove.

The pupa cell is excavated in the pithy substance of the gall and lined with silk.

This moth should be compared sufficiently for separation with other species from Quercus galls. It differs from *Hospes* and *Gallivora* as follows: Front blue-black, whilst they have front white: legs black; they have legs yellow: palpi black and yellow; they all yellow with mere tip black. *Rubristigma* has red bar; they black. Compared with *Aegeria querci* from galls on live oak it is twice as large. *Querci* has lemon-yellow lines on side of thorax, antennæ brown, yellowish beneath; has nearly all the abdominal rings with bands costa lemon-yellow beneath, leg-joints whitish, pectus lemon-yellow; in all these points *Rubristigma* differs decidedly. The differences are also as striking with *Nicotianæ*, with which Henry Edwards compared *Querci*, a species having a fiery-red discal mark.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—ANNUAL ADDRESS OF THE PRESIDENT.

BY E. A. SCHWARZ.

At the Ann Arbor meeting of our Club, in the year 1885, Prof. John B. Smith proposed as a subject of discussion "How shall we create and foster an interest in the study of Entomology?" In the discussion a rather gloomy view was then generally taken by the members regarding the general lack of interest in entomology in this country, Prof. Riley alone expressing himself hopefully as to the future outlook. As the best means for creating such interest the production of a *popular* compendium of North American insects was recommended, but the discussion only dwelt upon the difficulties in the way of producing a popular and yet valuable work.

Now, no one can deny that within the few years that have elapsed since 1885 a great change has taken place, a change which has been alluded to by others, and among them by Prof. A. J. Cook in his presidential address delivered at the Indianapolis meeting of this Club in 1890. Many new and conscientious workers in the various branches of both pure and applied entomology have appeared; orders or families of insects hitherto sadly neglected have found competent students; the life histories and earlier stages of a multitude of insects have been studied and recorded with a thoroughness and exactitude previously rarely attained; entomological instruction, both of a scientific and practical nature, is now given by competent teachers in many colleges; the increase in popular interest in entomology is manifested in the many collections that have recently been formed by young beginners; and, finally, even the newspapers have ceased to make fun of "bug catchers." In short, the combined work of our entomologists from the time of Say and Harris down to our day begins to bear fruit, and has enforced for entomology that recognition among the other sciences which her importance demands.

An excellent illustration of this change can be found in the records of last year's meeting of our Club, held at Washington. In his admirable address as president of the Club, Prof. Herbert Osborn again proposed the production of a Manual of North American Entomology, but this time not of a popular one to create and foster an interest in the study of entomology, but of a scientific compendium for the use of the advanced

student, a work which should embody in a conveniently condensed form all those contributions to general, to systematic or to biologic entomology, which in their totality represent the present state of knowledge of North American insects, and which are now so sadly scattered through the literature. The members of the Club then present greeted the project with applause; no gloomy views regarding its practicability were heard, the only serious objections made being of a business nature. A committee was appointed, which in due time submitted a favourable report. For want of time this report could not be discussed last year, but the committee was instructed to submit a "well-digested scheme one year hence", and I sincerely hope that the proceedings of our present meeting will contribute toward an early realization of this important plan. For my own part I subscribe to every word that has been said in its favour by Prof. Osborn in his address, and by other members during its preliminary discussion. Many of us will have given attention to this subject during the past year, each in his own specialty, as I have myself. And I have more particularly considered in my own thoughts how the collated and combined work hitherto accomplished in North American coleopterology will compare with a certain manual on European Coleoptera, which has done eminent service, and to which I shall refer later.

It is generally supposed that North American coleopterology is in a better, *i. e*, more advanced state to be represented in a compendium, than most other orders, and upon reflection I find this to be the case in some respects, but not so in others. On this subject I have noted down some remarks which I beg leave to present herewith in a condensed form.

In order to study insects we must first collect them, and I have, therefore, to devote a few words to the state of exploration of our country. The history of the entomological exploration of North America has many interesting points which are not generally known, but I cannot possibly review the whole subject, and shall confine myself to the progress made since the foundation of this Club in 1874. The older members of our Club will remember that at that time, or a little previously, Coleoptera from California or even Colorado were to be found only in a few cabinets; to-day the Coleopterous fauna of the Pacific Slope, Colorado, Kansas and some other Western States are in many of our Eastern collections by far better represented than those of Georgia or Maine. The completion of the Southern Pacific Railroad opened for easy exploration a vast extent of territory previously but imperfectly known; coleopterists

have not been slow to avail themselves of this opportunity, and an unexpectedly large number of hitherto unknown species have been brought from that region, especially from Arizona. Skilled field coleopterists have been over the lines of all other transcontinental railroads constructed since 1874, including the Canadian Pacific Railroad (opened in 1886), and over most of their branches. In short, the whole country lying west of the Rocky Mountains and east of the Sierra Nevada may be said now to be explored as well as can be expected by entomological travellers or expeditions. This exploration is necessarily more or less superficial, a mere skimming of the surface. What is needed for the region mentioned is the presence of a number of active *resident* specialists; for even the most expert collector is unable during a few weeks' excursion to thoroughly explore even a very small area. He cannot acquire that local knowledge which is necessary to a thorough investigation; he has but little chance for making biological observations, and he cannot possibly keep track of the species appearing in the different seasons of the year. What can be accomplished by the work of resident specialists has been shown of recent years in California, and, thanks to their labours, the fauna of that State is now as thoroughly known as that of Pennsylvania or Virginia.

There is something else needed for the West, viz., a *speedy* exploration wherever possible of those sections where the native flora and fauna are still intact from the inroads of civilization. Faunas and floras of small islands have within the memory of a single generation undergone great changes; native species have disappeared and cosmopolitan species have taken their place. The island of St. Helena is a familiar and often quoted example of this influence of human cultivation, and not long ago one of our botanists complained of the inevitable extermination in the near future of some of the plants peculiar to one of the most interesting faunal regions of the West, viz., the islands off the coast of California. This influence of man not only produces changes on islands of smaller or larger extent, but also affects, though in a much slower way, larger faunal regions. In 1891 I had, in the company of Mr. H. G. Hubbard, an opportunity to visit the more readily accessible parts of the Wasatch Mountains of Utah, and a few days' exploration convinced me that the aboriginal fauna of that range must have been quite different from what we found. This range, once covered with a magnificent coniferous forest, has now been more or less completely denuded in consequence of

mining operations; whole mountain sides are now kept bare of any vegetation whatever by snow slides. In the more sheltered portions and on the plateaus a scanty growth of deciduous trees and shrubbery has replaced the conifers; thousands of sheep, which are driven through the canyons up the mountain, make annually a complete sweep of the alpine and subalpine lower plants. It is no wonder under these circumstances that species peculiar to these mountains are now but few in number and rare in specimens, and that there is an undue proportion of species which are evidently immigrants from other regions. Along the base of the mountains irrigation and cultivation have effected a still more radical change and utterly exterminated the native flora and fauna. Even along the old water courses within the irrigated districts the insects have disappeared. Similar conditions prevail all over the West; in the Southwest irrigation and sheep, and in the Northwest the axe of the lumberman, and forest fires are hard and fast at work destroying the original flora and fauna. Of course, there are in the West many square miles of virgin ground left, but if we are desirous of preserving a record of the original fauna, there is need, as I said, of a speedy exploration.

There is still very little known of the Coleopterous fauna of Lower California and more especially of the tropical part of this peninsula. How large a proportion of the Coleoptera of Alaska has been described, or is at least available for study in our cabinets I do not know, but judging from the fact that the Swedish Vega expedition brought home from the northwest coast quite a number of species previously unknown, I presume that much still remains to be investigated in the western part of Alaska and in the interior.

In the country east of the Rocky Mountains the progress of exploration has of course been much more thorough than in the newer west. Since the formation of this Club the faunas of Texas and Florida, hitherto but imperfectly known, have yielded a large number of new forms; the White Mountains of New Hampshire have been very carefully explored, and this mountain range is the only one in North America which may be said to be thoroughly investigated, not only in regard to Coleoptera, but also some other orders. Besides this a large amount of very careful collecting has been done at many points within the Northern, Middle and Western States with a thoroughness which was utterly unknown to the coleopterists of thirty years ago, and which has, I fear, resulted, in some nstances, in the extermination of a few choice species. At any rate, it

gives us for the first time a correct idea of the fauna of many restricted localities. The results of the most careful local investigations are not recorded; it may be of interest, therefore, to learn that the Coleopterous fauna of what, in my opinion, is the best explored point in North America, viz., the District of Columbia, amounts to upward of 3,200 species.

The absence of resident coleopterists in a large portion of the South, and more especially in Georgia, Alabama, Louisiana, and Arkansas is sorely felt; the high mountains of North Carolina have never been explored coleopterologically; only a small portion of the semitropical region of Florida has been visited by coleopterists; and what little we know of the Coleoptera from the extreme northwest is due to the exertions of European entomologists. A recent Danish writer informs us that twenty-five species is the total of what is known of the Coleopterous fauna of Greenland!

To sum up: I fully believe that if the material of North American Coleoptera now scattered in many collections could be concentrated we would have a very fair representation of our fauna, and this not only in the larger and more conspicuous species, but also in the previously neglected Microcoleoptera even of those groups which have not yet been worked up.

I may add that, thanks to the example and advice given by a few coleopterists, specimens in collections are now generally much more carefully mounted, and, therefore, more readily available for study than was the case some twenty years ago. The old reproach that specimens from American collections are poorly mounted or pinned, and generally in a miserable state of preservation has no longer any force. On the other hand the importance of a more exact and more scientific mode of labelling is slowly becoming recognized by our coleopterists, and still disregarded in some collections which would otherwise possess high scientific value. Improvement and progress in this respect are, however, visible of late years.

That the classification of the North American Coleoptera is more advanced and in a more satisfactory condition than that of any of the other large orders, is almost wholly due to the genius of two men. It was Dr. Leconte who at an early period of his studies recognized that our Coleoptera had to be treated in a monographic or synoptic way, based upon studies independent of the classification of the European fauna. What he accomplished during his lifetime has been ably set forth by

others more competent than I His work has been taken up and continued in a masterly way by Dr. Horn, whose numerous contributions to coleopterology during the past twenty-two years are in every respect models of monographic treatment. That his work has not only advanced the knowledge of North American Coleoptera more than the combined work of all previous authors, but also that it has contributed largely to the classification of Coleoptera in general, is universally acknowledged, and I need not dwell here on this point. But what I desire to emphasize here is the eminent practical usefulness of Dr. Horn's descriptive work. There are hundreds of other valuable monographs on Coleoptera and other orders, not to speak of the almost countless descriptions of isolated genera or species. In studying these, how often is the need or necessity felt, even by the most experienced and painstaking student, of examining what is known as the type of the author in order to obtain clearness in regard to a species or genus. In fact a considerable proportion of our more recent entomological literature is filled with the discussion of types and with the results of examinations of typical specimens, not only those of the older, but also of recent authors. Costly journeys to places where types are preserved are the order of the day, and even the finding of such types in a large museum has developed into a science. It would appear, indeed, as if the types were everything, and the published descriptions only of secondary, or of no value whatever. Now, what I mean with regard to the practical usefulness of Dr. Horn's descriptive work is that here this element of uncertainty and ambiguity is eliminated. With admirable acumen and tact characters of structural nature, which are readily understood and unmistakable to the student are here grasped, their relative importance recognized and set forth in the descriptions in a concise way, so as to leave no room for doubt. The types of Dr. Horn's work are not the frail and perishable specimens in his cabinet, but his published descriptions, which cannot be destroyed by museum pest or fire, and which have become the common property of entomological science.

The number of other American contributors to systematic coleopterology has considerably increased since the time our Club was organized, and some work of an excellent character has been produced, but also some work which, for one reason or another, has not always marked a real advance in the knowledge of the family or group treated. Whoever thinks that a useful monograph or synopsis of a family or even of a large

genus of Coleoptera can be produced after one or two weeks' study is greatly mistaken, and should not be astonished that his work is accepted with distrust and disfavour on the part of the working coleopterists. But carelessness and superficiality are by no means always the cause of adverse criticism. There are some contributions to systematic coleopterology written with evident and painstaking care and after much study, and containing many valuable observations on classification. Still their value is greatly impaired by a singular defect. Excessive, and, in my humble opinion, unnecessary, multiplication of genera, now the fashion of the day, is no serious drawback to the study of insects. Genera do not exist in nature, their erection is a mere matter of tact and experience, and they can be rejected or accepted by the working entomologist provided that the components of genera, viz., the species, are known. The species is the unit and the element upon which our classification is based, and whatever difficulty or impossibility there is in the definition of the term "species" from the modern scientific standpoint, there is certainly an easy explanation from the practical standpoint. A species is what the consent of the most experieneed specialists considers as such. I am well aware that in many instances such consent cannot be obtained, yet there are comparatively few genera in our fauna where there is dispute or uncertainty regarding specific limits. If this appreciation of what should be considered as a species is not acquired, if slight variations or individual differences are constantly mistaken for and used as specific characters, this defect cannot be remedied by descriptions be they ever so long, nor the use of the most powerful microscope. Even the most careful and often repeated study of papers of this sort is not able to dispel the clouds of doubt and the veil of uncertainty that overhang and obscure all parts of the subject so treated.

There are a few groups of Coleoptera which have never been monographed. With the exception of one, viz., the sub-family Aleocharinæ of the family Staphylinidæ they are of comparatively small extent, but all of such a nature as to render their synoptic treatment a most thankless and by no means inviting task. Their omission, or only partial treatment, would not seriously interfere with the value of a compendium.

The second edition of the Classification of the Coleoptera of North America by Drs. Leconte and Horn shows that a compendium, such as proposed by Prof. Osborn, can be easily prepared as far down as genera are concerned; all that is needed is to make the additions and alterations

rendered necessary by subsequent papers. But I fully believe that American coleopterology has now advanced so far that even tables and diagnoses of the species can be given; in short, that it is possible now, if the preparation of the work is entrusted to the able hand of Dr. Horn, to produce a compendium fully equal in completeness, value and usefulness to Ludwig Redtenbacher's well-known Compendium which deservedly obtained a success unparalleled in the history of descriptive entomology. It bears the modest title "Fauna Austriaca [Austrian Fauna].—The Beetles", but is practically a full synopsis of the Coleoptera of North and Middle Europe, with tables of all European genera, and numerous references to the species of Southern Europe. Its influence on the progress of coleopterology cannot be overestimated, and is best illustrated by the fact that the work, although quite a bulky volume, quite expensive, and consisting exclusively of dry scientific descriptive matter, went through three editions during the life time of the author, each edition being fully brought up to date. The third edition, although now almost twenty years old, is still in the hands of every working coleopterist all over the globe. Its success as a scientific work, and as a business enterprise, has rendered possible the publication of a similar work on the Diptera of Europe, an order which at that time was perhaps more neglected in Europe than it is now in North America. I refer to Schiener's well-known "Fauna Austriaca.—The Diptera" which is modelled after Redtenbacher's work.

What is practically a fourth edition of Redtenbacher's work is now being published by Prof. M. Ganglbauer, of Vienna, and embodies, of course, the more recent progress in classification, and also enlarges the geographical scope of the work; but, what is by far more important, it promises to give due and full regard to the biology of Coleoptera. This leads me to indulge in a little speculation as to what role the biology of North American Coleoptera would play in the proposed compendium. I regret to say that I cannot draw here a very roseate picture.

Biology of Coleoptera is a slow science, and has by no means kept equal pace with the progress in the classification of the imago. The cause of this deficiency is to be found not so much in the lack of interest on the part of our coleopterists, but to the many difficulties that surround the subject on all sides, even in the elementary branches of the science. If we except a portion of the Chrysomelidæ, a portion of the Coccinellidæ, a portion of the Dermestidæ, and a few other genera or species, the mere finding of Coleopterous larvæ is a difficult thing, the rearing of the same still more

difficult, and the tracing of complete life histories from the egg to the imago state has been successful in comparatively few instances. The investigation of the food habits of imagos and larvæ, which is such a simple thing in Lepidoptera, becomes a complicated subject in Coleoptera. In the description and classification of the larvæ coleopterology encounters difficulties which do not exist in Lepidoptera. Coleopterous larvæ are, almost all of them, of a uniform colour. There is not that infinite variety of various ornaments, such as tubercles, bunches of long and bristly-coloured hair, appendices of various sorts, etc., which are of so great assistance in the description of caterpillars; their distinguishing structural characters are very minute, difficult to observe and to describe, and their relative importance and value have in many families not yet been pointed out.

In brief, the biology of our Coleoptera is yet in its infancy and coleopterology has not yet derived therefrom that benefit which the lepidopterists have obtained from a comparatively full knowledge of the earlier stages and general development. But I may be permitted to state here in defense of the coleopterist that, with all due respect to the many contributions of a purely scientific character, the great progress in the biology of Lepidoptera is in no small measure due to the desire on the part of the mere collector to obtain by breeding fresh imago specimens for their cabinets. This incentive is wholly absent in Coleoptera.

Of our commonest species of Coleoptera we are unable to find the earlier stages, and those larvæ we find commonly cannot be bred to the imago state. There is but little exaggeration in this sentence. But in spite of this difficulty there have been formed within the last twenty years some large collections of Coleopterous larvæ, which is, of course, the elementary and most important step toward a knowledge of them. Thanks to the attention given to this subject by Dr. Riley, there is now at the Agricultural Department in Washington a collection of Coleopterous larvæ which is the more valuable since most species have been actually bred. An idea of the extent of this collection can be formed from a list published some years since in "Insect Life", and enumerating nearly 130 species which could be spared from the duplicates. Since that time the accessions to this collection have been unusually large, not only from the eastern part of the country, but for the first time we find here represented, thanks to the exertion of resident specialists in Coleoptera, quite a number of genera or species peculiar to the Pacific slope. Hardly

inferior in extent is the collection of larvæ preserved at the Museum of Comparative Zoölogy, and I have no doubt that good collections are at the laboratories of the Cornell University and at Champaign, Ills., though I have no personal knowledge of them. Finally, I hope that valuable material is accumulating at the various experiment stations. What I said before of collections of imago specimens may be repeated here : if the biological material now scattered in various collections could be concentrated we would see that far more has been accomplished than we are generally inclined to suppose. Still, there is an almost exasperating want of knowledge of the larvæ of just such families or genera the systematic position of which is in doubt. Thus the larva of the South American *Hypocephalus armatus* would throw light, and in all probability fully clear up the affinities of this remarkable and much discussed beetle. In our own fauna, if we had the larvæ of *Cupes* or *Rhyssodes* the uncertainty regarding the affinities of these families would be removed ; if we had the larva of the genus *Nicagus* we would at once know whether it is a Lucanid or a Scarabæid.

The life histories of Coleoptera, so far as these are of common importance have generally been well studied and recorded with great thoroughness. The investigations of the life histories of our Blister beetles, the root-feeding Chrysomelidæ, the Elateridæ, the May beetles, are only a few examples of what has been done since the foundation of our Club. How much can be learned by careful study of the natural history of what were supposed to be well-known Coleoptera is illustrated by Dr. Riley's recent discovery of the first larval state of our common Bean and Pea weevils (Bruchidæ), and also by Prof. Forbes's admirable studies in the food-habits of our common Carabidæ and Coccinellidæ.

Outside of economic entomology very little work has been done in the investigation of the full life history of our Coleoptera, except the almost countless little notes that have been published on the food-habits or other habits of both imago and larva, on the mode of work of the latter, time of appearance, length of life, number of annual generations, etc. These notes furnish in their aggregate much valuable, though somewhat fragmentary material for the biology of many species and genera. How difficult it is to trace the full life history of a given species is well illustrated by the Coleopterous Beaver parasite, *Platypsyllus castoris*. Through the exertions of Dr. Riley the most careful investigations were carried on in various parts of the country and at various seasons to fill

the gaps existing in the knowledge of the history and earlier stages of this beetle. Our most skilled field observers tried their hands in this investigation, scores of beavers were carefully combed from head to tail, the contents and surroundings of beaver dens, either of a dry, moist or wet nature, were thoroughly sifted, then packed up, shipped to Washington and here again subjected to the closest scrutiny. All of no avail; our knowledge of the natural history of *Platypsyllus* has not advanced a single step; even that mysterious object the "ultimate larva" has never been found or seen again, and stands out prominently as a sad example of disconnected solitude.

American contributions towards a classification of Coleopterous larvæ are very few, but we have a large number of scattered descriptions of single species. Some of this descriptive work has been excellently done, but a large proportion of these descriptions, both in scientific and economic literature, leaves much to be desired. There seems to be a notion on the part of some writers that it is a meritorious thing to draw up as quickly as possible and publish a description of any Coleopterous larva. If we examine such descriptions it will be found that they are not of any popular value because the untrained reader cannot understand them anyhow; nor are they of any scientific value because the student cannot find any tangible points in them. Such writers do not seem to be aware of the fact that there are many Coleopterous larvæ provided with six legs, the body being more or less flattened, the head a little darker and the thoracic segments a little longer than the abdominal segments, which are more or less transversely wrinkled. Quite a number of larvæ also have a Y-shaped mark on the head. Much better descriptions than those just characterized were excusable in bygone times when there was little known of the classification of Coleopterous larvæ, or when what little there had been published was generally not accessible to the American entomologist; but to-day where, in the works of Perris and Schiœdte, we have safe guides to the classification of Coleopterous larvæ of many families, descriptions of such larvæ should no longer be the result of momentary impulse but of a good deal of study and comparison.

It will take many years of hard work before the biological material accumulated in the collections mentioned above can be adequately worked up, and this work will be the more retarded, in my opinion, because I fully side with those who believe that at the present state of biologic science descriptions of Coleopterous larvæ ought to be accom-

panied by the most careful and detailed illustrations. But good figures are difficult to obtain. With admiration and envy I look at the splendid figures, unsurpassed in beauty and accuracy, that adorn, and in the true meaning of the word, illustrate, Schiœdte's monumental work, and I lose heart if I compare them with the cheap process figures of the most recent American works. How often have I seen the most splendid and accurate drawings made by our best draftsmen tortured into an irrecognizable mess by this modern process! I fully comprehend the many practical obstacles in the way of having our entomological publications illustrated with costly plates, but I have often asked myself why it is that we do not return to the trusty lithography or the faithful wood engraving which have illustrated many famous entomological works formerly produced in America. I regret that I am unable to give an answer to this question, beyond expressing the hope that a time will come when again a small amount of good and careful work will be more appreciated than a great deal of quick but much less satisfactory work.

In summing up the present state of the biology of our Coleoptera all I can say is that some good work has been produced, but that much more remains to be done on all sides. It is here, more than in systematic coleopterology, that we need more observations, more study, more work, and more workers.

Let me close my remarks with an appeal for more work and more workers in this field, and let me address this appeal to a class of men who by their training, their knowledge, their facilities for work, are best fitted to render assistance. I mean the entomologists of our Agricultural Experiment Stations. It has been asserted, not only once, but repeatedly, before this Club and elsewhere, that the economic entomologists are too much overburdened with professional duties to do any work in pure science. In reply let me point out that a great deal of the best work in entomology has been the work of love, and not of paid labour; that a great proportion of the best work in all branches of entomological science has been produced by men in the leisure moments of a busy professional life. Are our Station entomologists more overburdened with duties than a hard working teacher or a hard working physician? Above all, do not let us forget that the study of insects is no work, but that it is a recreation of the purest kind, a source of the highest pleasure; and no other science possesses a more powerful and fascinating attraction than our beloved entomology.

SOME BEAUTIFUL NEW BOMBYCIDS FROM THE WEST AND NORTHWEST.

BY B. NEUMOEGEN, NEW YORK.

MELIA, n. gen.

Head small, sunk in prothorax, hairy. Front narrow and hairy. Antennæ plumose. Palpi minimal. Thorax stout and very pilose. Abdomen stout, tapering off.

Primaries oblong, half as broad as long, well rounded at angle. Costa straight, apex rounded. Four submedian nervules, vein 5 apparently issuing out of cross vein. Three subcostal nervules, two of them forking off near apex. Secondaries nearly as broad as long, well rounded at apex. Anal angle well pronounced, like in the Notodontidæ. Median cell weakly connected by cross vein, looking like an open cell on a superficial glance. Three median veins, the fourth being replaced by a small groove or fold, which runs through entire wing from base to anterior margin, thus equally dividing it. Subcostal vein bifid near apex. Two submedian veins.

Legs well developed and extremely pilose, with tibial spines of good size, but covered by the hair. Tarsus, tarsical segments and claws prominent.

The genus is of sombre colour, and a near relative to the European genus Ptilophora, Stph., the antennæ and legs showing it. It has to be placed in our lists after the genus Gluphisia, B. Some of the latter genus likewise show indications of a horizontal fold in the secondaries, as, for instance, *G. rupta*, Hy. Edw.

Melia danbyi, n. sp.

Head, collar and thorax dark gray, powdered with minimal grains of yellow, of which latter tint are the rims of the prothorax and patagiæ. Eyes black. Antennæ gray with miminal yellow granules at base of stem. Abdomen dark gray with thin blackish segmentary lines.

Primaries dark gray, powdered with infinitesimal granules of lighter gray, and tufty at base. Costa dark gray, tipped with blackish colour near apex. Nerves black. A number of transverse undulating lines from costa to inner margin, of brownish black, the t. a. and t. p. lines being more visible than the rest. The t. a. line especially so, with whitish

accentuations inwardly, thus forming small whitish spots near costa and inner margin respectively. A small whitish costal spot near apex, and several small similar spots at inner rim of t. p. line.

Secondaries uniformly mouse-gray, somewhat hyaline in median and submedian basal areas. The entire anal margin tufted with lighter gray hair. At anal angle, between the submedian veins, a black blotch with several small white kernels. Slight indications of a transverse undulating line. Nerves brownish, and fringes of both wings brownish.

Below: Head black. Legs and abdomen of dark gray. The former very pilose, the tips of the hair tinted with yellowish gray. Black claws and tarsi, with white segments. Whitish abdominal bands.

Primaries and secondaries mouse-gray with whitish granules. The t. p. line only visible and accentuated by a whitish costal dot, surrounded by black.

Secondaries have two dark curved transverse lines, marked by two irregular, black costal dots. Basal areas of wings and anal margin of secondaries tufted with lighter gray.

Expanse of wings, 38 mm. Length of body, 10 mm.

Habitat: Victoria, B. C. Type, one ♂. Coll., B. Neumoegen.

This insect has been caught at electric light by Mr. W. H. Danby, and I take pleasure in naming it after him.

Hyparpax venus, n. sp.

Head yellowish with rose centre. Antennæ light brown. Eyes black. Collar, thorax, patagiæ, as well as primaries, of beautiful light rose colour. Nerves concolorous. Fringes whitish. Beyond median cell, from costa to inner margin, a transverse white line, slightly bending inwardly at its centre.

Secondaries and nerves white, with a rose coloured marginal line along costa and margin to anal angle. A rose tint along anterior margin, fading towards centre.

Abdomen yellowish-white with rose anal tuft.

Below: Primaries and secondaries of yellowish-white with concolorous nerves and fringes. Costas rose and broad marginal rose tints, especially so in primaries, fading towards centres.

Legs rose coloured. Prominent yellowish-white tibial spines.

Expanse of wings, 30 mm. Length of body, 9 mm.

Habitat: Colorado. Type, ♂. Coll., B. Neumoegen.

This is another of the discoveries of beautiful insects we owe to Mr. D. Bruce. It seems to be a rare species, for Mr. Bruce only caught one last year, and this summer only five specimens, among which one ♀, which, as he writes me, tallies in all details with the ♂ ♂. Its name is warranted by its beauty.

Notodonta descherei, n. sp.

Head gray; prothorax and thorax dark gray and pilose, rimmed with black. Patagiæ dark gray with whitish granules and black rims. Thorax, at abdominal juncture, prominently tufted with black. Antennæ light brown. Abdomen gray, with a light brown covering on first two segments. Legs gray, very hariy, except tarsi, which are black and have white segments and claws.

Primaries dark gray with white apical tinges reaching as far as third median vein. Interspaces of costal and subcostal veins marked by three black dashes, the upper one resting on costa, encircling an irregular white costal spot, the latter being the starting point of a transverse sinuate line of irregular whitish spots, terminating on inner margin near angle with a spot, surrounded by black. The basal field, as well as the median interspaces of a light brown shade. A black basal dash, edged with silvery white along basal portion of submedian vein. Nerves blackish. Fringes dark gray with black dots at nerval intersections. A black terminal line edged with white inwardly.

Secondaries light gray, shading somewhat darker near apex and anal margin, which latter is heavily tufted. A black shade with minimal white granules at anal angle, shading off towards median veins. Fringes and terminal line light gray, turning in anal region into the black colour of anal blotch. Nerves grayish-brown.

Below: Primaries blackish-gray from base to beyond discal cell, shading into lighter tints along anterior margin. Apex whitish, and a whitish costal spot above disk. Slight whitish indications of the transverse line. Terminal line well marked.

Secondaries gray with darker costal field of basal part and dark anal blotches. A suffused transverse white narrow band skirting edge of median cell. Terminal line blackish and prominent.

Expanse of wings, 45 mm. Length of body, 10 mm.

Habitat: Victoria, B. C.

Another of Mr. Danby's handsome captures at electric light. I take pleasure in naming this pretty insect after my lifelong friend, Dr. M. Deschere, of this city.

Halesidota sanguivenosa, n. sp.

Head, prothorax, thorax, patagiæ and abdomen brick red. Collar light yellow with a dividing centre line of yellow. Light yellow also marks the centre line of patagiæ, the sides and abdominal edges of thorax. A faint centre line of yellow on abdomen. Antennæ light brown with yellow dots at stem. Palpi yellow. Eyes black.

Primaries and costa brownish-red, of a lighter tint along anterior margin. All nerves blood red. Fringes, as well as the following maculations in light yellow.

Two transverse lines, a transverse posterior and a subterminal line, the former sinuate. The s. t. line consisting of irregular triangular spots, pointed inwardly, terminating at submedian vein, the t. p. line made up of irregular oblong spots, going right through and resting on inner margin. Irregular horizontal dashes along costa and median vein, a large somewhat triangularly shaped spot covering disk, pointing towards base. Small dots and dashes in basal part of intercellular space, and a basal dash on inner margin.

Secondaries semi-hyaline, of a delicate light yellow, tinged reddish along anal margin. Nerves and fringes concolorous.

Below: Primaries dull brownish-red with a vitreous sheen. All maculations as above and partly transparent.

Secondaries as above, with a prominent costal centre spot of brick red. Yellow segmentary bands on abdomen. Legs yellow, with an outer cover of bright brick red.

Expanse of wings, 31 mm. Length of body, 7 mm.

Habitat: Vancouver Island. Type, ♂. Coll., B. Neumoegen.

Undoubtedly one of the handsomest Halesidotas so far discovered in our fauna. To Mr. Chr. I. Weidt, a young professional collector, belongs the credit of its capture.

PREPARATORY STAGES OF CATOCALA STRETCHII, BEHR.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Diameter, .04 inch, about .03 of an inch high; roundish conoidal, base broad but rounded, striated from base to micropyle, thirty-two striæ on the broadest part, sixteen of which reach the micropyle but a few are emitted just as they reach the circle; with very shallow cross striæ. Colour of micropyle whitish, a broad zor below this of purplish-red, next a narrow whitish zone about half the width of the red zone, then another red zone below the whitish, the last a little less than half the height of the egg. Duration of this period 157 days.

Young larva.—Length, .22 inch; cylindrical, slender, head flattened, the first and second pairs of prolegs atrophid. Colour after feeding, pale green, the head pale reddish-brown, three narrow, faint, dark lines on each side that are apparently purplish-brown, a spot or patch of the same on the centre of each joint ventrally; piliferous spots very small; hairs short, dark. Before eating the colour is dull smoky with a greenish tinge. Duration of this period four days.

After first moult.—Length, .30 inch; shape as before. Pale whitish-green, each side with three pale reddish-purple stripes, separated by stripes of the ground colour, a broken stripe of the purple along the lateral folds; head brown; piliferous spots as before; also the ventral spots. Duration of this period five days.

After second moult.—Length, .40 inch. Colour in stripes; the dorsal pale and with two pale stripes on each side, the lower substigmatal; the pale stripes having a pale outer part with darker centres, the dark slightly ellipsoidal on each joint; the dark stripes with dark edges and slightly paler centres but the contrast not so great as in the pale stripes. The dark part is pale red of a slight purplish-brown shade, the light part slightly creamy white with also a tinge of yellowish in the incissures of the joints. The dark centres of the pale stripes not quite so dark as the dark part of the dark stripes. Over joints 9, 10 and 11 the dorsal stripe is more distinctly white with little of the dark centre, the sides of the posterior part of joint 9 and the anterior part of joint 10 obliquely black shaded; also a little of this on joints 10 and 11; slight traces of this between joints 5 and 6, 6 and 7, and 7 and 8, seen more in intensifying the dark colours at these points. Piliferous spots inconspicuous, hairs jet black; no trace of lateral fringe; venter with dark spots on all the joints except thoracic. Head obscurely striped with the body colours.

One example shows much more of the black shading than the others, having it quite prominent between all the abdominal joints and in the dark parts of the stripes as a shading or staining. Duration of this period seven days.

After third moult.—Length, .70 inch. Striped as before but the striping more delicate, the stripes now showing that they are composed of dots, the dots in the dark stripes being a little darker than the dots forming the light stripes, the darkest dots forming the lines separating the stripes; the pale stripes show a little orange tinting, especially on the incissures; the piliferous spots inconspicuous, orange, the posterior on joints 9 and 12 a little more prominent, a blackish patch from those on 9 back obliquely on to the sides of 10; a small amount, mere trace, of the black back of the posterior dorsals of 12. Head coloured like the body, an anterio-lateral black stripe and an imperfect anterior one. Venter whitish, a large black patch in the centre of each abdominal joint; those of thorax blended into a narrow stripe. The lateral fringes begin to show. Duration of this period seven days.

After fourth moult.—Length, 1.10 inches. Only slightly changed from the preceding stage. Colour delicate whitish lilac; the piliferous spots a little more prominent than before and the fringe more developed though still short; the posterior part of joint 9 elevated between the posterior pair of piliferous spots, carrying these with the elevations, about .02 of an inch above the rest of the dorsum, the elevation orange in the centre, and from here blotches of orange and black extend obliquely down the sides on to the anterior part of 10; top of head with a slight orange tubercular elevation on each side of the centre making the head a little bilobed, a nearly continuous black stripe from the outside of base of tubercle down to the eyes, the rest of the head densely mottled with pale lilac and white; a very slight green tinge over the whole body, especially the venter, which is white with this green tint, the central round black spots on each joint proportionally smaller than before and the thoracic portion only a broken reddish-black stain between the legs; hairs inconspicuous, the upper black, the lower gray. Duration of this period seven days.

After fifth moult.—Length 2.50 inches. Very little change from the preceding stage: varying from a very pale lilac gray to darker, the pale forms having the piliferous spots and the elevation on joint 9 pale Naples yellow, the darker ones only a little darker of the same shade of yellow,

the latter with a black dot outwardly posteriorly to each piliferous spot, the black dot inconspicuous in the paler ones. Spiracles black. Very little or no shading of dark on lateral part of 9 on pale forms; head as before.

Mature larva.—Length, 2.50 inches. More robust than at the beginning of this period. Width of head, .15 inch; of joint 2, .25 inch; middle of the body, .35 inch; nearly cylindrical, venter a little flattened and the lateral fringe makes it appear more so than it really is; character of markings about as last described; in the light forms there is little variation in the shade of the light and dark stripes, the general effect being a pale lilac gray. The piliferous spots are very pale, but little darker than the ground colour. The dark stripes, as is usual, are composed of dots varying from a purplish-red to a reddish-black, those on the pale stripes simply averaging lighter, elevated part of the dorsal of 9 very pale orange. Head with the upper part yellow-orange. Venter as before. The dark forms have the greater average of dark dots in the dark stripes, and the ground colour in these stripes is darker, especially at the incissures, making sharp contrast between the light and dark stripes, but the piliferous spots are the same. Duration of this period four days.

Chrysalis.—Length, 1.30 inches; wing and tongue case to posterior part of joint 5, .55 inch; depth through 5, .32 inch; through 4, .33 inch; through 3, .34 inch; through 2, .32 inch; nearly cylindrical, tapering gradually back from 5, anterior part rounded, antenna case extending as far back as the wing case; punctures of abdomen small and shallow; cremaster so blunt and short as scarcely to be called conical, depressed ventrally, corrugated irregularly but mostly longitudinally, ending in a few hooks of varying lengths. Colour dark chestnut-brown, covered with a white bloom. Duration of this period from 44 to 53 days.

Three spun in the upper corner of the box in which they were raised two together in one common cocoon, the rest in the lower part, mostly in the corners and edges just above the dirt, on the sides of the box and among the refuse twigs and leaves where these came against the sides of the box, others among the leaves of the food-plant. The cocoon is thicker and more compact and firm than that of most species, those in the upper corners of the box being smooth inside, firm and mingled with loose web outside.

The eggs from which these larvæ were raised were sent me from

Colton, California, by Mr. G. R. Pilate, and were deposited Oct. 21, 1888. They hatched March 27, 1889, and the last one hatched June 20th, making a total period from egg to imago of 242 days. The food-plant given me by Mr. Pilate was cotton wood or willow. At the time they hatched the willows were just beginning to swell their buds a little. These were given to them and they ate them by boring into them, acting as borers in this stage just as the larvæ of *Ilia* do in oak buds; and some of them continued this boring habit till after the second moult, the young leaves at this time being about half an inch long. The fringe along the sides of the larvæ places this species near *Ilia* instead of with some other species that do not have the fringe; but of this I expect to have something to say in another article.

SYNOPSIS OF THE NORTH AMERICAN SPECIES OF ASTATUS, LATR.

BY WM. J. FOX, PHILADELPHIA.

FEMALES.

1. Marginal cell as long or longer than the first submarginal (if shorter it is scarcely noticeable)..... 2
   Marginal cell always much shorter than the first submarginal.....6
2. Dorsulum rather strongly and closely punctured.....3
   Dorsulum more or less sparsely punctured 5
3. Entirely black..... .....*unicolor.*
   Abdomen red 4
4. Pygidial area long, narrow, a little more than twice longer than it is broad at the base; stigma of wings black.....*bicolor.*
   Pygidial area of a more triangular form, not more than twice longer than its base is broad; stigma of wings yellowish....*pygidialis.*
5. Metanotum with a well-marked, triangular depression at apex; the length of the marginal cell is fully equal to the first submarginal; pubescence of thorax white..... .....*occidentalis.*
   Metanotum without a well-marked depression at apex (if present at all it is very faint); the length of the marginal cell is a little less than the first submarginal; pubescence of thorax black; abdomen black or red and black..... ..... *nubeculus.*

6. Metanotum with coarse, irregular, radiating striations; antennæ and legs stout..... *nevadicus.*
Metanotum finely sculptured 7

7. Tegulæ testaceous; metanotum finely granulated..... *montanus.*
Tegulæ whitish; metanotum very finely striated.....*elegans.*

MALES.

1. Marginal cell as long or longer than the first submarginal (if shorter it is scarcely noticeable).....2
Marginal much shorter than the first submarginal 6

2. Entirely black.....3
More or less red.....5

3. Pubescence of thorax black; forewings, except basal third fuscous; metanotum strongly reticulated.....*nubeculus (=nigropilosus.)*
Pubescence of thorax white.....4

4. Wings hyaline throughout; first joint of flagellum fully one-third longer than the second; metanotum not depressed before apex.....*unicolor*
Forewings stained with fuscous medially; first joint of the flagellum about one-quarter longer than the second; metanotum more or less depressed before apex..... *occidentalis.*

5. Pubescence of thorax white; metanotum recticulated.....*bicolor.*
Pubescence of thorax black.....*nubeculus.*

6. More or less red; tegulæ whitish; wings subhyaline.....7
Cæruleous; wings fuliginous .....*cæruleus.*

7. Metanotum very finely granulated .....*elegans.*
Metanotum very finely and transversely striated.....*bellus.*

ASTATUS, LATR.

Astatus, Latr. Precis. Caract. gen. Ins., p. 114., 1796.

Astata, Latr. Hist. Nat. gen. et part. des Crust. et Ins. III., p. 336., 1802.

Astatus, Kohl. Verh. Zool.-botan. Gesell. Wien. XXXIV., p. 431, 1885.

1. ASTATUS UNICOLOR, Say.

Astata unicolor, Say. Exped. St. Peter's River II., p. 337, ♀; Smith, Catal. Brit. Mus. Hym. IV., p. 310, pl. VIII., fig. 1., 1856, ♂.
Canada to Texas.

2. ASTATUS OCCIDENTALIS, Cress.

Astata occidentalis, Cr. Proc. Ent. Sect. A. N. S. Phila., 1881, p. III., ♂ ♀.

Resembling closely *nigropilosus*, but is at once distinguished by the white pubesence, and by the marginal cell being fully as long as the first submarginal; the depression on metanotum, apically, is much stronger. Length, 12-14 mm.
Nevada, Montana, Washington.

3. ASTATUS NUBECULUS, Cress.

Astata nubecula, Cr. Proc. Ent. Soc. Phila., p. 466, ♂.

Astata nigropilosa, Cr. Proc. Ent. Sect. A. N. S. Phila., p. IV., 1881, ♂ ♀.
Col., Nev., Cala., Mont., Washington.

4. ASTATUS BICOLOR, Say.

Astata bicolor, Say. West. Quart. Reporter II., No. 1., 1823; Lec. Ed. I., p. 166. ♀ ♂.

Astata rufiventris, Cress. Trans. Amer. Ent. Soc. IV., p. 218. ♀

Astata terminata, Cress. ibid. ♂.

Canada and the entire United States. *A. terminata*, Cress., is a slight variety, having the metanotum a little more strongly roughened.

5. ASTATUS PYGIDIALIS, n. sp. ♀.

Front strongly and rather closely punctured, sparsely so along the inner orbits; vertex very sparsely punctured; the distance between the hind ocelli is almost twice greater than that between these ocelli and the inner eye-margins; antennæ rather stout, first

joint of the flagellum about one-quarter longer than the second, which is about equal to the third; collar and dorsulum rather strongly and closely punctured; scutellum, except on sides, almost impunctate; metanotum roughened and with irregular, radiating striations or ridges and with a strong medial carina, which extends to the apex where it joins a transverse curved ridge, which bounds the strong pyriform depression at this place, the sides and posterior face of metathorax roughened; legs tolerably stout, the posterior tibiæ and tarsi strongly spinose; abdomen very sparsely punctured; pygidium about twice as long as it is broad at the base, the sculpture appearing squamate. Black; mandibles medially, clypeus medially, scape beneath, tegulæ and legs, rufo-testaceous; abdomen entirely ferruginous, with a somewhat yellowish tinge; head and thorax clothed with tolerably dense, white pubescence; wings subhyaline, the apical portion darker; stigma yellowish; marginal cell a little shorter than the first submarginal, obliquely truncate. Length, 8-10 mm. Three specimens. New Jersey, Texas.

6. ASTATUS NEVADICUS, Cress.

Astata nevadica, Cr. Proc. Ent. Sect. A. N. S., Phila., 1881, p. V. ♀.
Nevada, N. Mex., Montana, Washington.

7. ASTATUS MONTANUS, Cress.

Astata montana, Cr., l. c., p. V. ♀.
Nevada, Col., Mont.

8. ASTATUS ELEGANS, Cress.

Astata elegans, Cr., l. c., p. VI., ♀ ♂.
Nevada, Col., Mont., Washington. This species appears to be closely allied to the *A. stigma* of Europe.

9. ASTATUS BELLUS, Cress.

Astata bella, Cr., l. c., p. VI., ♂.
So. California.

10. ASTATUS CŒRULEUS, Cress.

Astata cærulea, Cr., l. c., p. IV., ♂.
Nevada.

ON EUDRYAS STAE. JOHANNIS, WALK.

BY A. R. GROTE, A. M.

I saw the type of this species in the British Museum and considered it to represent a distinct species, allied to *E. grata*. Prof. Smith says, CAN. ENT., 134, "I have no hesitation in referring the species (?) as a suffused aberrant *grata*." Now the hindwings want the band and are immaculate, hence there is no "suffusion" on the secondaries. The forewings resemble *grata*, but the markings differ. I could see no "suffusion." The specimen seemed larger to me than *grata*. The specimen may be an extraordinary variety of *grata*, but not a "suffused" variety. Prof. Smith says:—"The type is marked 'Taken on the church door at Horsley Downs.'" And further:—"It is probable that in some way the pupa of the insect was transported to England and through the vicissitudes encountered an aberration was produced." This explanation does not seem reasonable to me. I do not know what is meant by "the vicissitudes encountered." Pupæ of *grata* transported to England would probably produce typical *grata*, just as pupæ of other species produce the typical form when they emerge on this side of the water. The voyage could not change a *grata* to a *Stae. Johannis*. I think this is certain. And, now, what did Walker mean by the name? He evidently supposed the specimen was taken at the St. John's River, Florida, and probably by Doubleday. He did not then believe in the authenticity of the label now attached to the species. Or is the church at Horsley Downs named in honor of St. John? The specimen is at any rate evidently American, as the genus *Eudryas* is found nowhere else. It is, as it stands, one of the most curious of the uniques in the British Museum collection. The improbability that it should have been taken on a church door in England (?) is very great. That the label might have been wrongly attached, or changed from some other specimen, seems less improbable when we consider the chances of its being so taken. If a variety of *grata*, or a distinct species, it seems likely that our collectors in Florida may throw some light on the subject in the future. If *grata* varies in this manner, the conditions will probably occur again and the variety be produced. It may be even that the specimen represents a South American species unknown to us. As the case stands, it cannot be called a "suffused" variety I should say, and the mystery is certainly not cleared up by the statements of Prof. Smith. We must find other

specimens of *Eudryas Stae. Johannis* before we can feel that any certainty in the matter has been secured.

[I find, on reference to the "Clergy List," that Horsly-Down is a parish of Southwark in Surrey, and that the church is named St. John's. I have, therefore, no doubt that Walker named the insect after the church where it was found. That Lepidoptera may become suffused, or altered in coloration, by a voyage across the Atlantic is evident from the fact that, out of ten pupæ of *Vanessa antiopa* recently sent to England by Mr. Fletcher, no less than five turned to the remarkable variety *V. Lintneri*. It is very probable that the specimen of *E. Stæ. Johannis* came from the pupa of an *E. grata* transported in some way across the Atlantic. The feminine termination "Stæ" is very singular.—Ed. C. E.]

PHLEGETHONTIUS 5-MACULATUS.

As an illustration of how insects will at times survive what seem to be the most unfavourable conditions, I may state that in October last there was given to me a chrysalid of the Tomato Sphinx, *P. quinquemaculatus*, Harris. Having no convenience for keeping it in a natural condition, I took a bit of cotton batting and made a bed for it on the bottom of my hatchery, which is a paste-board box with a gauze cover. The location of the box is on top of a high book-case, hence it gets the full benefit of the heat of the room during winter, which was sufficient to mature some Platysamias by the 10th of April. On the 16th of May that pupa gave a well developed imago. It was between six and seven o'clock p. m. when it emerged, and by half-past nine it was flying around the box, so I put it in the cyanide bottle; but it was killed too soon, for although the nervures were fully extended, and quite rigid, the membranes for three-fourths of an inch at the points of the front wings had no firmness to keep them apart, and they came together like the ribs of a closed umbrella. Otherwise the specimen was perfect in every respect.

J. Alston Moffat.

A REARING OF MELITTOBIA.

On the 21st September, 1891, on opening a small box of neglected insects, etc, I caught a glimpse of several minute black flies as they flew out. At the time I could not imagine what they were. The next day I collected a lot of pupæ of Tachina flies and enclosed them in tin boxes to transform to imagines, but instead of the perfect fly appearing, the boxes were filled with the same small flies as I had observed issue from the opened box on the day previous, and then, as I remembered having had some of those Tachina puparia in the box, I readily understood whence the flies came. The pupæ from which those little black hyper-parasites were bred were taken from the cells of the common Mud-dauber wasp. Afterwards I observed two specimens of this secondary parasite creep from a minute opening in the end of a pinned pupa of the primary Tachina fly which I had taken from a Mud dauber's cell and put in my cabinet. I mailed specimens of this species to the Department of Agriculture at Washington, where it was identified as *Melittobia pelopaei*. This shows that the species of Melittobia are not exclusively parasitic on Hymenopterous insects, but are sometimes secondary parasites. As Mr. L. O. Howard wrote that the species of Melittobia had heretofore been reared only from Hymenopterous insects, I thought this rearing of *M. pelopaei* from Dipterous puparia might prove of interest.

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[Interesting papers on this genus will be found in the Proceedings of the Entomological Society of Washington, Vol. II., No. 2, viz: -"Notes on the genus Melittobia," by W. H. Ashmead (p. 228), and "The habits of Melittobia," by L. O. Howard (p. 224).—ED. C. E.]

Mailed Sept. 3rd.