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PAPILIO.

III

DEVOTED EXCLUSIVELY TO LEPIDOPTERA.

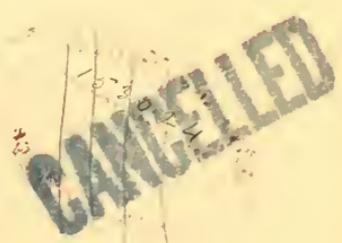
VOL. III.

EDITED BY

HENRY EDWARDS.

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GEORGE

PAPILIO.

Organ of the New York Entomological Club.

Vol. III.]

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[No. 1.

[The following paper was written for the November number, but owing to a delay in transmission of the proofs to Mr. Edwards, it was thrown over to January.]—Editor PAPILIO.

NOTES ON THE COLLECTION OF BUTTERFLIES MADE BY MR. H. K. MORRISON, IN ARIZONA, 1882.

BY W. H. EDWARDS.

This collection embraces about 100 species, all taken in the vicinity of Fort Grant, Cochise Co., and on Graham Mountain. It is remarkable for the many species of certain families and for the absence of others. In the Hesperidæ it is especially rich, embracing no less than 38 species, or one-third the collection. Of these 9 are *Thanaos*, and 8 are *Eudamus*. In *Lycæna* there are but 7 species, in *Thecla* 8, in *Chrysophanus* none. In the *Lemonidæ*, 6. The *Satyridæ* number but 2, and these are *Neonymphæ*, viz., *Rubricata*, Edw., and *Henshawi*, Edw. I should have expected one or more species of *Chionobas*, *Satyrus*, *Hipparchia* and *Coenonympha*, but none appear.

In *Papilio* 4 species, one of which, *Philenor*, Linn. is common at the East, and one which I regard as a variety of *Rutulus*, Bd. In *Parnassius* nothing. In *Pieris* only 2, *Protodice*, Bd., and *Sisymbri*, Bd., the latter of which was very rare. In *Colias* but 2, *Cæsonia* and *Eurythme*. In *Terias* 2, *Nicippe* and *Mexicana*. In *Anthocharis* but 2, *Stella*, Edw., and *Hyantis*, Edw. In *Callidryas* 1, *Eubule*. In *Argynnis* but 1, *Nausicaa*, Edw. In *Melitæa* 3, none of them belonging to group I of my Catalogue, 1877, i.e., the *Chalcedon* group; 1 to group II, or *Palla* group, the others, southern forms, belonging to group III. In *Phyciodes* but 3, of which *Pratensis*, Behr, and *Mylitta*, Edw., fly from the Rocky Mountains to Pacific. The third, *Picta*, Edw., is southern, very common in New Mexico. In *Eresia* 1, *Texana*, Edw. In *Synchlœ* 1, *Crocæle*, Edw. In *Grapta* but 1, *Satyrus*, Edw. In

Limenitis and Heterochroa 4, Apatura 1, Paphia, 1. In Libythea 1, *Carinenta*, Cram.

A few observations on some of these species will be proper here.

1. PAPILIO DAUNUS. Bd.

Three examples were sent me, all immense, expanding, ♀ nearly 6 inches; the male 5.75. On the ♀, the breadth of the black border between the outer tails is nearly one inch. The Northern examples of *Daunus*, or those which fly in Nevada, have scarcely more than half the superficial area of these Arizonians.

Mr. Neumoegen received through his agent, Doll, in 1881, two blown skins of the mature larva of *Daunus*, and three living chrysalids. One of the latter was given me, and Mrs. Peart made drawings of it, after which I put it in alcohol. The other two Mr. Neumoegen retained. One of them, on 7th Sept., 1882, gave imago, the other is still alive, and will pass the second winter. So protracted a chrysalis term I never have known for any Diurnal, though not very unusual in certain Sphingidæ.* I cannot discover any tangible difference between the chrysalis of *Daunus* and that of *Turnus*. The caterpillar is similar to that of *Turnus*, and has the same black and yellow stripes across dorsum, at junction of segments 5 and 6, and has also an ocellated spot on side of 4. But in these examples, this spot is round, with a round pupil, and higher on dorsum are two quadrangular solid yellow spots with black eyes, one of these being attached to the ocellar spot, the other separated. In *Turnus* there is an obovoid black ring, with two elongated inside spots, or there is an eye-shaped spot, outlined black, with an elongated black pupil. *Turnus* varies, therefore, as to these spots on 4, and a series of *Daunus* might do the same, but at present the only difference I discover is in the shape and number of these spots.

Mr. E. M. Dodge, while at Boulder, Colorado, last summer, found both *Daunus* and *Indra* plenty (the latter on the summits of the mountains, just as it has been found by Mr. Henry Edwards, in Nevada), and observed *Daunus* ♀♀ ovipositing. By confining one of them in a bag over a wild plum branch, he obtained about 50 eggs, and mailed them to me. Unfortunately they never reached me, and so a good opportunity was lost for getting at the whole series of preparatory stages.

PAPILIO RUTULUS. Bd.; VAR.

Of this I received 6 ♂♂, and have inspected 1 ♀, belonging to Mr. Neumoegen, taken in Arizona. For several years I have endeavored to obtain eggs or larva or drawings of *Rutulus*, but have utterly failed to get any one of the preparatory stages. Mr. Mead, while in California, in 1878, induced a ♀ to lay eggs for

* In Can. Ent. 9, 135, Jacob Boll notes a like occurrence with occasional chrysalids of *P. Ctesiphontes*.

him, on cherry, and the larvæ hatched. But in subsequent journeyings they starved. In PAPHIO, for September, 1882, Mr. H. Edwards relates that he had the larvæ of California *Rutulus* past third moult, but then lost them. The stages, as described by him, do not agree with the figures of same stages of *Turnus* as given in Vol. II., But. N. A.

The distinctive marks of *Rutulus* of the Pacific Coast, as compared with *Turnus* of the Atlantic, are many.

1. The fore wings of *Rutulus* are more falcated.
2. The tails are straight, of nearly or quite even width, and not spatulate.
3. The common black band, which crosses middle of cell of secondaries, is more decided. It is heavy and black, as in *Eurymedon*. In *Turnus* it is faint.
4. On the under side there is an absence of fulvous or orange on hind wings, both in the marginal lunules and in the median interspaces of the disk. *Turnus* has much orange.
5. In the ♀ *Rutulus*, the blue scales on secondaries, upper side, form a stripe, broken at the nervules. In ♀ *Turnus* they form conspicuous lunate patches, materially unlike the other.
6. The color of *Rutulus* ♂ is sometimes very dark throughout, what is called Indian-yellow.
7. In ♀ *Turnus* there is a large sub-rotund fulvous spot at outer angle of hind wings, upper side. In ♀ *Rutulus*, either no spot there, or a narrow line, as in *Eurymedon*, almost always yellow.
8. No black females of *Rutulus* have been seen; but black females predominate vastly as we go southward, in *Turnus*. In fact, in the trans-Mississippi region, and through Texas, a yellow female *Turnus* is an extreme rarity. Now many Texan butterflies fly also in Colorado and Arizona. Even the black ♂ of *Lyc. Violaacea* is taken in South Colorado. So that the absence of black females of this *Papilio* is remarkable, and unaccountable, on the theory that *Rutulus* is a var. of *Turnus*.

In many of these points *Rutulus* agrees with *Eurymedon*. If the latter were colored like *Turnus* it would pass for *Rutulus*. In fact, *Rutulus* is nearer *Eurymedon* than to *Turnus*.

Rutulus, as it manifests itself on the Pacific Coast, should unquestionably be regarded as distinct from the Eastern *Turnus*, even without knowledge of the caterpillar.

The form taken in Arizona and South Colorado differs in some respects from both the *Turnus* and *Rutulus* types. But it most resembles *Rutulus*.

1. In the shape of the tails, inasmuch as they are not spatulate, but bent inward like *Eurymedon*. The outer edge of the tail makes an arc of a circle.

2. In the absence of orange. There is none at all in either of the examples. In two ♂♂ from South Colorado, one is free from

orange, the other has a trifle both on the lunules and in the interspaces, thereby approaching *Turnus*.

3. The common black band before spoken of is heavy, as in *Rutulus*.

In the shape of the wings, all these males resemble *Turnus*, not being falcated. But the female, and one from South Colorado (the only ♀♀ I have seen) have the shape of *Rutulus*. I call this form *Rutulus*, var. *Arizonensis*.

There cannot be a doubt that *Turnus*, *Rutulus*, *Eurymedon*, *Daunus* and *Pilumnus* come from a common parent, but there is not the least evidence produced to show that they are not of co-ordinate value amongst themselves, or that one is derived from any other of the group. Quite the contrary. We know all about *Turnus*, at any rate. It flies from Alaska to Newfoundland, and southward to the Gulf and Texas. At the North, it has but a single generation; in the United States it has acquired a second, and in the female, dimorphism manifests itself. Now, except in difference of size, of the shade of yellow (the northern examples being pale colored), and in the definition of the black stripes and bands (the northern having these somewhat diffused, ragged-edged), *Turnus* is everywhere essentially the same. No one has thought of specifying even a variety of it. It has spatulate tails everywhere; a large orange spot at outer angle of hind wings everywhere, ♀, and considerable orange on under side. It is wonderfully true to one type for so widespread and flourishing a species. (Of course, every marking of any species will vary somewhere, and no marks are absolutely constant. Among the myriads of *Turnus* flying over a continent, individuals ought here and there to appear without a fulvous spot at outer angle, or a spatulate tail, or orange. But these would at once be set down as aberrations, as unusual and uncharacteristic.) Now, if eggs of *Turnus* produced individuals with the special characters of *Rutulus*, there would be some ground for saying that *Turnus* had come from *Rutulus*, and these exceptional examples were due to reversion. And the reverse is true. We have not yet bred *Rutulus*, but the species has been taken since the days of the Argonauts, and I have yet to hear of the first example which discovers the characters of *Turnus*. Therefore, there is no evidence that *Rutulus* has sprung from *Turnus*, and to assert that the two are, or ever were, one species is to assert what no one can possibly know.

Dr. Hagen informs me that in a series of examples, taken by him in Oregon, he can show the gradations between *Papilio Oregonia*, *Zolicaon* and *Machaon*, and he pronounces all three, besides quite a number of allied Asiatic forms of this group, to be one species only; that is, the species is *Machaon*, and all the rest are varieties thereof, and should, together with the parent (as he esteems it), be called one species. So far as concerns the American

members of this group, I will venture to say that the case really stands on all fours with that of the *Turnus* group, and that these members are co-ordinate, one as near the parent stock, the progenitor of the whole of them, as another. But, suppose it should really be a case of derivation, a thing which I have seen no evidence of, and which could best be ascertained by breeding the several forms from the egg; and that *Machaon*, in course of ages, has cast off *Hippocrates*, and *Hippocrates Zolicaon*, and *Zolicaon Oregonia*. The question for us is, not what they were, nor where they came from, but what they are to-day. Are these derived forms prominent; are they permanent; do they show any signs of reversion? There is not the least evidence that they are not permanent forms, breeding true to type. Any apparent intergrades may be accounted for on the ground that they are aberrations or hybrids. Every group comprehended under a genus name has sprung from a common parent form; every sub-group, in same way, one degree further on; and when a derived form has attained the features mentioned, prominence and permanence, it is as much entitled to rank as a species as was the form from which it sprung. To claim that these independent varieties can never cast loose from the parent, and must always fly under its wing, is as if all animals bred were to be called varieties of ascidians.

Of course, this does not suit the views of the ancient school, who looked upon a species as the result of a creative act, and held it to be *teres atque rotundus* at the outset, neither to be enlarged nor diminished. And so every species was to be herded in a separate corral, the parents and all their progeny to be carefully kept together. If one of the latter, no matter whether of the half-blood or the sixteenth, jumped the fence, there was as great a hue and cry as used to be made for a runaway slave. 1863 settled the status of this last individual, and 1861 that of the other. The corral is open henceforth, and any capable variety may lawfully aspire to be a species. "The race is to the strong," literally. Let us hear Prof. Owen: "I apprehend that few naturalists now-a-days, in describing and proposing a name for what they call a new species, use that term to signify what was meant by it 20 or 30 years ago. . . . The proposer of the new species now intends to state no more than he actually knows; as, for example, that the differences on which he founds his specific character are constant in individuals of both sexes, so far as observation has reached," etc. That is all we can know of such things as dried butterflies, and to assume that a new form, because it has a certain resemblance to some other named one, must necessarily be a variety of that one, is unwarranted. If the amount of difference is important, the new form has its rights as a species, at least till the contrary is actually proved; and that can only be done by breeding from the egg.

CALLIDRYAS EUBULE. Linn.

Mr. Morrison had written that he found a species of Callidryas on Mount Graham, at an elevation of more than 10,000 feet, which seemed to him extraordinary for so tropical a genus as this—as indeed it was. One ♂, one ♀, are received. The ♂ is undistinguishable in size, color and marks from many *Eubule* of the Southern States; viz, those with no marks whatever on the under side save the very small discal spots. But the female is *white*. Now, I find nothing in the books of a white female of *Eubule*. Mr. Butler, in his monograph of Callidryas, says nothing of such a form. Mr. Morrison writes that he took but four examples of both sexes, by reason of their wild flight. This female is size of the ♂, color white with a slight green tint; the costa of primaries edged pale black; the hind margins of same wings also edged pale black, but more decidedly than costa, and the inner side of it crenated. Secondaries have a narrow macular blackish border; primaries have a rounded discal spot or patch, blackish, with a buff streak through it on the arc of cell. On the under side there is almost a complete absence of streaks or patches, but still there can be made out enough scales to show that there is a likeness to ♀ *Eubule* of the normal type. The arrangement is similar. So are the discal spots of both wings like those of ♀ *Eubule*. I have several examples of the nearly allied species *C. Sennæ*, and on the under side, every one of the females has very large discal spots, and distinct streaks and patches of pink-brown scales. So that this Arizona female does not resemble the *Sennæ* under view on the under side. But on the upper side, it more closely resembles *Sennæ* ♀ than *Eubule* ♀, in the marginal and costal edgings especially. The discal spot of primaries is rather *Eubule* than *Sennæ*, the spot on this last species being much larger than in *Eubule*.

ARGYNNIS NAUSICAA. Edw.

This fine species—size of *Aphrodite*, and belonging to same sub-group—was described in Trans. A. E. Soc., Vol. V., 104, 1875, from one ♂ two ♀, taken by Mr. Henshaw, at Rocky Cañon, Arizona, 1874. Up to the present time, no other examples have been brought in, so far as I am aware. I have from Mr. Morrison three ♂ four ♀, and have seen one ♂ one ♀, sent to Mr. Neumoegen from same collection. I have been asked wherein this species differs from *Halcyone*, Edw. This latter, in the ♂, is figured in Vol. I But. N. A., but the ♀ was unknown at the time that plate was drawn. Later, Mr. Morrison brought back both sexes from South Colorado. It belongs to another sub-group, standing near *Coronis*, Behr. A conspicuous difference will be seen in the discal row of silver spots—in *Halcyone*, *Callippe Coronis*, *Edwardsii*, these being large and egg-shaped. They are very noticeable. *Liliana*, H. Edw., is another of this sub-group, with still larger silvered spots. But in *Nausicaa*, these spots are

small, narrow and elongated, entirely different from the great egg-shaped spots of the other. In color of upper side, *Halcyon* in both sexes is yellow-fulvous, *Nausicaa* deep red. Mr. Doll, in 1881, took no *Argynnis* in South Arizona, and the present species is the only one of the genus taken by Mr. Morrison, so that probably it is the most southern of all American *Argynnis* in its habitat. North-east Arizona, in the White Mountains, contains other species, as *Nokomis* and *Nitocris*, we know, but Colorado is the metropolis of the *Argynnis*s.

LIMENITIS URSULA, var. ARIZONENSIS. Edw.

Attention was called to this peculiar form in "PAPILIO" 2, 22, 1882, and all the examples of *Ursula* taken by Mr. Morrison were of this type.

APATURA ANTONIA Edw. var. MONTIS.

Of this form I received 3 ♂ 3 ♀. *Antonia* was described, 1877, *Field and Forest* III., 103, from Texan examples of the low country. They were yellowish-brown, ♂, the ♀ more decidedly yellow; under side pale gray, and gray-brown. The Arizona examples (Colorado also) are fulvous above; bluish-gray beneath, but in other points they agree with *Antonia*. This species has usually three ocelli on fore wings above; beneath three, four, and even five. The upper two ocelli have the black pupils nearly occupied by large white patches. Both *Celtis* and *Alicia* have one large black and blind ocellus, in the second median interspace. But *Antonia* has another, just as large, in the upper median interspace, and both are pupilled, sometimes both with white, sometimes the upper one white the other blue, sometimes both blue. Under side, in var. *Montis*, bluish-gray over costal and hind margins and apical area, of primaries and the whole of secondaries ♂, except that the lines of the latter are brown and a nebulous brownish band crosses the wing anterior to and partly enveloping the ocelli; no white on this wing; the inner margin of primaries is fawn-color, and so is all the cell except for a gray edging to sub-costal; the spots in middle of cell are just as in *Celtis*, a small one lying against sub-costal, a larger one next median below the other, and the two are separated by a space equal to the length of the upper spot. The female has the area of secondaries outside the ocelli blue-gray with a pink tint, and the rest of the wing, from base to ocelli, is pale fuscous with a wash of gray; so that there is a striking contrast between the disk and the marginal area in color; no white whatever on this wing. Mr. Edgar A. Dodge sent me a male of this var. *Montis*, taken last summer at Boulder, Colorado, and says it was not uncommon in ravines. No doubt this form has been confounded with *Celtis* of the Eastern States, but the number of ocelli on forewings is a sufficient distinguishing character, apart from coloration.

A. Leilia, Edw., inhabits So. Arizona, and Mr. Doll brought home many specimens in 1881, also a few *Antonia*, of which I

have 2 ♀ before me. They are like the Texan examples, lighter colored than those from Mt. Graham. One has 4 ocelli in each of forewings; the other has 4 above, 5 below.

On the other hand, all of Mr. Morrison's are *Antonia*, var. *Montis*. *Leilia* is represented in But. N. A., vol. II, in as perfect a figure as can be made, and as *Celtis* is on same plate the distinction between the two is patent. But as all collectors are not familiar with that plate, I will say that *Leilia* ♂ has a greatly produced anal angle and two rows of clear white spots on forewings; three ocelli in same as in *Antonia*. On the under side of primaries, the inner margin and cell are chestnut-red. The two spots in cell of *Celtis* and *Antonia* are represented in *Leilia* by a band across whole cell, and between this and the band on arc is a pure white space. All this is very different from either of the species named, and is enough to distinguish *Leilia* at a glance.

PAPHIA.—Six examples were received of a species distinct from the one found in the Mississippi Valley, *Glycerium*, Edw., not Doubleday. (Mr. Scudder, by-the-way, afterwards named this *Andria*; but I am satisfied it is *Troglodyta*, Fab. In this Mr. Butler coincides with me). I sent an example of the Arizona form to Mr. Butler, and he writes me that no such insect is in the Br. Mus. collection, nor has been described to his knowledge. I call it *Paphia Morrisonii*, and will describe it in a subsequent number of PAPHILIO.

THECLA LÆTA, Edw., But. N. A., vol. I. p. 141, pl. 47.

I was much surprised at finding *Læta* in the collection, and I learn that about 30 examples were taken. Hitherto single individuals of this beautiful species have been found in Pr. Quebec, in Ontario, Maine, Catskills of N. Y.; at White Sulphur, W. Va., and at Coalburgh, W. Va. It has remained till now the rarest of our Theclas. In 18 years, I remember to have seen only 3 examples at Coalburgh. But in Arizona, we seem to have found its true home. And it is wonderful, when we come to think of it, that a delicate butterfly, expanding scarcely more than one inch, should have found its way through the whole series of States, even into Canada. It has not changed its color or markings at all, that I can discover, with its wandering.

LYCAENA PSEUDARGIOLUS. Bd.

This is a delicate and small species also, and it is found from the Boreal regions to Mexico, in one phase or other, being polymorphic. But it is not a stranger like *T. Læta*, seen here and there occasionally. It possesses the whole country, and where found is abundant. Mr. Morrison sends examples of both sexes of the form *Pseudargiolus*, and also of the winter form *Violacca*, Edw. But these last differ from any I have seen, in having the under side dark gray. I call it var. *Cinerea*.

No *Lycaenæ* of Groups 1, 2, 3, Edw. Cat. were taken, but 2 of Gr. 4, and the remainder, 4 in all, belong to Gr. 5.

THECLA IROIDES. Bd.

This species is near *Augustus*, Kirby, and is found on all the Pacific slope, from British Columbia to Arizona. *Augustus* flies over the Boreal regions and Eastern States. The size of these Arizona examples, the female having nearly twice the superficial area of the eastern relative, led me to think it a new species on first examination. But Mr. Morrison tells me he found fully as large examples in California.

THECLA ALCESTIS. Edw.

Described from Texas specimens sent by the late Jacob Boll. One of our largest species of the *Favonius* group. A single example was taken in Arizona. As others were brought by Mr. Morrison from So. Colorado, the species probably has its habitat more to the southward, Texas to Mexico.

Coalburgh, W. Va., November 1, 1882.

LIST OF SPECIES OF BUTTERFLIES COLLECTED
IN ARIZONA BY MR. H. K. MORRISON, IN 1882

· Papilio Daunus, Bd.	Pyrameis Cardui, Linn.
· " Rutulus, Bd.	" Carye, Hübn.
· " " var. Arizonensis, Edw.	· Limenitis Ursula, var. Arizonensis, Edw. -
· " Bairdii, Edw.	" Eros, var. Obsoleta, Edw.
· " Philenor, Linn.	" Weidemeyerii, Edw.
· Pieris Protodice, Bd.	Heterochroa Californica, Butl.
" " form Vernalis, Edw.	· Apatura Antonia, Edw., var. Montis.
· " Sisymbri, Bd.	· Paphia Morrisonü, Edw.
· Nathalis Iole, Bd.	· Neonympha Rubricata, Edw.
· Anthocharis Stella, Edw.	· " Henshawi, Edw.
" " Hyantis, Edw.	· Libythea Carinenta, Cram.
· Callidryas Eubule, Linn.	Lemonias Cythera, Edw.
· Colias Cæsonia, Stoll.	" Nais, Edw.
· " Eurytheme, Bd.	" Palmerii, Edw.
" form Keewaydin, Edw.	" Ares, Edw.
· Terias Nicippe, Cram.	" Cleis, Edw.
" Mexicana, Bd.	Charis Nemesis, Edw.
· Danais Archippus, Fab.	Thecla Halesus, Cram.
" Strigosa, Bates.	· Thecla Alcestis, Edw.
· Argynnis Nausicaa, Edw.	" Melinus, Hübn.
· Euptoieta Claudia, Cram.	" Apama, Edw.
· Melitæa Gabbii, Edw.	" Leda, Edw.
" Leanira, Bd.	· " Iroides, Bd.
" Thekla, Edw.	· " Læta, Edw.
" Minuta, Edw.	Lycæna Acmon West.-Hew.
" Perse, Edw.	· " Pseudargiolus, Bd.
· Phyciodes Pratensis, Behr.	· " " Viola-cea-Cinerea, Edw.
" Mylitta, Edw.	" Amyntula, Bd.
· " Picta, Edw.	" Alce, Edw.
· Eresia Texana, Edw.	" Exilis, Bd.
· Synchloe Crocale, Edw.	" Marina, Reak.
· Grapta Satyrus, Edw.	Copæodes Procris, Edw.
· Vanessa Antiopa, Linn.	" Myrtis, Edw.
" Milbertü, Grote.	Thymelicus Hylax, Edw.

Pamphila Taxilis, Edw.	Thanaos Afranius, Lintn
“ Comma v. Colorado, Scud.	“ Tadius, Edw.
“ “ v. Nevada Scud.	“ Clitus, Edw.
“ Snowi, Edw.	“ Funeralis, Lintn.
“ Phylæus, Dru.	Pholisora Catullus, Cram.
“ Deva, Edw.	“ Pirus, Edw.
“ Python, Edw.	“ Alpheus, Edw.
“ Pittacus, Edw.	“ Ceos, Edw.
“ Nereus, Edw.	Eudamus Pylades, Scud.
Amblyscirtes Ænus, Edw.	“ Nevada, Scud.
“ Nanno, Edw.	“ Moschus, Edw.
Pyrgus Tessellata, Scud.	“ Epigena, Butl.
“ Scriptura, Bd.	“ Hippalus, Edw.
Thanaos Brizo., Bd.	“ Cellus, Bd.
“ Icelus, Lintn.	“ Tityrus, Fab.
“ Ausonius, Lintn.	“ Dorus, Edw.
“ Propertius, Lintn.	Pyrrhopyga Araxes, Hew.
“ Pacuvius, Lintn.	

DESCRIPTIONS OF NOCTUID LARVÆ FOUND ON CUTTS' ISLAND, MAINE.

BY ROLAND THAXTER;

PSEUDOTHYATIRA CYMATOPHOROIDES. *Guen.*

Rich yellow-brown, varying in shade, mottled by fine dark lines. A contrasting white spot just above the stigmata of seg. 4, roundish and varying in size, sometimes altogether wanting. A fine, continuous black dorsal line. Head protruded and darker brown than the body. Stigmata black-brown, slender. L. 42 m. m. Three specimens found in cases between leaves, such as are made by *Charadra*. When at rest the body is bent, the head approaching the posterior segments. Spun a slight cocoon in moss September 20-25. Imago June 9 P. M.

Three specimens on red oak.

HABROSYNE SCRIPTA. *Gosse.*

Eggs somewhat pear-shaped, white, changing to bright pink after a day or so of exposure to the air, deposited transversely, singly or superposed in chains of five or six, on the margins or ribs only of raspberry leaves, July 21. A number of hair-like scales are also deposited with the eggs.

Mature larva.—Rich yellow-brown, often almost black. A distinct dorsal black line. Lateral portions more yellow, with blackish mottlings, and broken by blackish dashes which extend from the dorsal portions anteriorly and inferiorly, becoming pointed about the stigmata, where they end. Dorsal surface generally much darker than the rest of the body, though subject to considerable variation. In a few specimens one, two or even three white spots were present above and somewhat anterior to the stigmata on the fourth, fifth or sixth segments respectively; each spot having a central black dot. In some specimens a white spot

was present just below the stigmata of seg. 3, also a smaller lateral spot on seg. 1. Segments 2 and 3 are somewhat larger, and seg. 1 somewhat smaller than the rest. Head yellow-mottled with dark brown, the mottling contrasting. Beneath, dirty yellow, smooth, cylindrical, tapering posteriorly. Head prominent, moderate. Cocoon in moss, very slight, August 27, Pupa legs, 1. When at rest the larva rests either like a Notodontian, the anterior and posterior portions of the body being elevated, or bent so that the head rests upon the posterior segments. When not feeding the larva conceals itself in a case formed by curling down the edge of a leaf, as in the preceding species. Length 30 m. m.

I was unable to observe the early stages and only noted that the first was pinkish, without marks, and that in the stage before the last moult the larva closely resembled *Notodonta stragula* in its early moults.

PLATYCERURA FURCILLA. *Pack.*

Mr. Lintner has described the more common brown form of this larva in his Entomological Contributions, and the following is a description of a second form, which differs so markedly from that described by Mr. Lintner that I have, until very recently, considered it to belong to another species. Imagos, however, reared last summer from both forms show no constant variation.

The normal form is light chestnut-brown, with tufts of hair of the same color, the larger pencils on segs. 1, 2, 4, 11, deep chestnut, tipped with black. In the present dimorphic form the color is glossy black, growing dull and tinged with green, as the larva matures. Sparsely clothed with tufts of white hairs of about twelve tufts on each segment, except the first and last. These tufts are small and the hairs are of irregular length. On segs. 1, 2, 4, 11 are set pairs of sub-dorsal tufts, as in the normal form, but clear white or tinged with olive. There is a lateral row of whitish spots extending superiorly and anteriorly just below the stigmata, which are greenish-white. Otherwise the larva is without marks. Head shining black, clothed with a few hairs and with two indistinct whitish frontal streaks. Legs and prolegs light brown, moderately short, tapering posteriorly. Rests extended on a twig, with the head drawn down so that its frontal surface is parallel to the twig. Spins a double cocoon much like *Charadra*, in September (9th to 25th), the imago appearing in June and July. Feeds on white pine.

A similar larva was found on Linden, September 15, indicating a great variety in the food plant. The larva, when young, fed only upon the margins of the leaves.

CHARADRA DERIDENS. *Guen.*

Eggs on red oak July 4, flattened, ribbed, whitish, deposited singly or in rows on under side of leaf. Hatched July 11.

Young larva. Light green. On segments 2, 3, 4, 5, 6, respectively, a large, roundish, red sub-dorsal spot. Head large,

tinged with brown. Body tapering considerably posteriorly and sparingly clothed with long colorless hairs. L. 2.5 m. m.

After 1st moult, July 14. Color light green, white externally. The red spots much darker, smaller anteriorly. A white dorsal line, with indications of sub-dorsal ones. Hairs on segs. 1, 10, 11 longer than the rest. L. 5 m. m.

After 2d moult, July 19. Color as before. Dorsal, sub-dorsal and two lateral white lines. The red spots, dark wine-colored, and replaced on segs. 2 and 3 by tufts of short blackish hairs somewhat below the sub-dorsal line. Several long black hairs on segment 1, which protrudes laterally beyond the head. L. 8 m. m.

After 3d moult, July 23. Bluish green. Lines more distinct. The spots on 4, 5 and 6 smaller and blackish. Hairs composing the dorsal tufts, except those on seg. 1, 10 and 11 short; lateral tufts long (this applies to all stages). A lateral tuft of long black hairs on seg. 1. Head straw colored, edged externally with black, having a broad posterior black band from which two fine black lines diverge to the jaws. Legs and prolegs bluish-green. L. 11 m. m.

After 4th moult, July 26th. Very light bluish-green. Sub-dorsal spots minute. Head variously marked with black, light-green or straw color. Else as in the two preceding stages. L. 18 m. m.

After 5th moult, July 30. Much as before; the sub-dorsal spots hardly visible. In some specimens large suffused dorsal, dirty blackish patches.

After 6th and last moult, August 6. Every variety of color from clear blue-green to black or dirty brown. Sub-dorsal spots absent. Longitudinal streaks indistinct. Tufting as before; hairs slender, not stiff, white. A few lateral black hairs on seg. 1. Head variously marked from shining black with a few straw colored frontal spots to light straw color. L. 40-60 m. m. Cocoon August 15.

Concealed in a case between two leaves. Rests with the body unbent. The same larva was found on birch and elm. The mature larva has been described by Mr. Sanders in Can. Ent., Vol. 1.

The larva of *C. propinquinelinea*, which feeds on birch, walnut, maple and oak, is subject to a somewhat similar variation. One specimen found on maple at Mt. Desert, Me., was black, with a dorsal white band, and a lateral white band edged below with black. Beneath white. The long tufts on seg. 2 were clear black instead of red as normally. Other specimens on walnut were mottled with black.

C. deridens spins a close outer cocoon of fine pinkish silk and a coarse inner cocoon of brown silk. Imago in June and July.

RAPHIA FRATER. *Grote.*

Color generally dark, somewhat bluish-green, though subject to considerable variation of tint. Body covered with scattered bright yellow points, about twenty on each segment. A dorsal hump on seg. 2 surmounted by two short, blunt red prominences. On the dorsal surface of segs. 4, 8, 11 is a transverse mottled red-purple transverse band, interrupted centrally and somewhat crescent-shaped, which is bordered posteriorly and externally with more or less clear yellow. A lateral red point on segs. 1 and 2. Legs and prolegs light green, anal pair tipped with red. Head rather large, bluish-green, with minute lateral black point. L. 40 m. m.

Form very stout, tapering somewhat posteriorly and ending abruptly. Rests on the midrib on the under side of poplar leaves. Varies considerably in size, the males being much smaller and more slender than the females.

Spun a stout blackish cocoon on bark September 10. Imago June 10.

It is this larva or its ally, *R. abrupta*, that is figured in Harris' Correspondence, pl. 1, fig. 6. as "*Notodonta* sp., found under maple."

APATELA MORULA. *G. & R.*

Eggs on elm, July 6. Very small, much flattened, whitish. Hatched July 12.

Young larva.—Dirty greenish-white, without marks. A few white hairs, a sub-dorsal row black. Head tinged with brown.

After 1st moult, July 15. Light green. Legs and setiferous tubercles white. A sub-dorsal white band. A few anterior and posterior hairs very long. Head light green, with a few longitudinal dark streaks. L. 2.5 m. m.

After 2d moult, July 19. Brighter green. Sub-dorsal band more distinct, interrupted on segs. 1 and 10. A transverse median dorsal red band on segs. 4, 7, 11. Form more tapering abruptly anteriorly and gradually posteriorly from segs. 3 and 4. L. 6 m. m.

After 3d moult, July 22. Clear, light pea-green. A sub-dorsal yellow band growing faint on segs. 9 and 10. A conspicuous mottled dark red-brown dorsal patch on segs. 4, 7, 11, edged posteriorly and externally with yellow. A fine lateral white line. Two small dorsal reddish patches on seg. 1. Setiferous tubercles yellowish, bearing a few long whitish hairs. Head green anteriorly, mottled reddish posteriorly. Legs and prolegs green. L. 10 m. m.

After 4th moult, July 26. Dark yellow-green above, blue-green below. Colors brighter than in the preceding stage. Lateral line broken and inconspicuous, otherwise as in the preceding stage. L. 18 m. m.

After 5th moult, July 29. Colors more intense, the yellow and red of the dorsal spots contrasting strongly. In a few specimens seg. 8 has in all the above stages a dorsal spot less conspicuous than the rest, otherwise as in 5th stage. L. 30 m. m.

After 6th and last moult, August 2 (Mature larva). General color mottled-brown and greenish like bark. A dorsal black band contracted between each segment, containing a central dorsal white line. On segs. 4, 7, 8 this band forms a transverse dorsal hump edged with deep black and set with a few short white hairs. Above and below the stigmata are white, setiferous tubercles bearing whitish hairs. Segs. 1, 2 and 3 are set with tubercles bearing longer hairs than the others, which are directed anteriorly. A diagonal black mark suffused on segs. 1, 2, 3 runs superiorly and posteriorly just above the stigmata. Stigmata black, ringed with white. Head black anteriorly, dull carmine or orange posteriorly, with a central, arrow-shaped light brownish mark, and with several lateral whitish streaks. Legs greenish. Prolegs black. Beneath dirty greenish. L. 50 m. m.

This last moult is somewhat interesting, as with its change of color a corresponding change of habit supervenes and the larva, instead of resting on the upper surface of the leaves on which it spins a slight web, as in the preceding stages, betakes itself to the crevices of the bark, when it becomes almost invisible.

The black and brown tints do not appear immediately after the last moult and the larva differs little from the preceding stage till it has been exposed to the air for some time, the dark tints gradually appearing after several days. The same is the case in *A. furcifer* and *lobeliæ* and also in *Thyreus abbotii*, the early stages of all these being adapted to leaves, the last to bark.

In their early stages the larvæ of *A. morula*, *furcifer*, *Radcliffii*, and *clarescens* can hardly be distinguished at a glance, and all, except the last species, produce striking changes of color after the last moult.

The cocoon of *morula* is spun under loose bark or in the crevices, and can often be found on the trunks of old elms, though I have found the moth somewhat rare. The present brood began to spin August 9, producing a single imago September 7. The remaining cocoons will hibernate. The moth appears in June and July. The same larva was found on linden September 15.

APATELA VULPINA. Grote.

Before last moult. Body greenish-white, darker inferiorly, thickly clothed with long white hairs, slightly tinged with yellow. A jet black, rather short, thick black tuft on the median dorsal portion of segs. 4, 6, 7, 8 and 11. Head light greenish with a black dot on the frontal portion, each side of the median line,

also two inferior black spots. Legs light green, prolegs banded with black. L. 30 m. m.

Mature larva.—Body light bluish-green, whitish above, immaculate and without any black dorsal tufts. Thickly covered with tufts of long, curved yellowish-white hairs. A few short black hairs on 11 and 12. Head large, dirty-whitish, with a few darker mottlings, and two inferior black spots on either side. Stigmata yellow. L. 45.

Entered the earth September 9, where it spun a slight cocoon, changing to a somewhat slender olive-tinted pupa. Imago June 26, 11.30 A. M.

The long curved hairs give this larva a very curious appearance when at rest on the under side of a leaf, with its body curved about so as to form what appears to be an oval mass of down that is readily mistaken for a nest of spiders' eggs. The curved hairs seem to come to a sort of focus in the region of segment 9, which is very characteristic. Before entering the ground the body becomes dirty brownish-green, the hairs become dirty yellow, the head entirely black, without marks. Found on poplar and birch. This is the only species of *Apatela*, as far as I know, the larva of which enters the earth to spin its cocoon. A second specimen, to which no earth was given after it had changed its color preliminary to transforming, refused to spin a cocoon with bits of bark and other substances furnished for the purpose, and finally died, as it seems, for lack of earth to enter. This larva resembles very closely, in both the stages above described, the corresponding stages of the European *Apatela leporina*, but the mature larva of *vulpina* differs by the absence of any dorsal marks and, probably, in some other points. The pure white color of the imago is, doubtless, protective, and connected with the white color of the bark of its second food plant.

APATELA NOCTIVAGA. Grote.

Eggs on poplar, July 14. Hatched July 9. Young larva. Color greenish-white. Dorsal portions of segs. 1, 4, 7, 8 and 11 red; the rest more or less tinged with red. Sparsely clothed with long blackish hairs. Beneath greenish-white. Head brown, rather stout, not tapering. L. 3 m. m.

After 1st moult, July 12. Color dirty greenish. Segmentation very distinctly marked. Dorsal patches dull reddish on superior portion, the other segments (except 9 and 10) suffused with red. Head dirty red, greenish anteriorly. Somewhat thickly covered with tufts of stout black hairs. L. 5.5 m. m.

After 2d moult, July 12. Much darker than before, the red colors having become dark wine-color, somewhat mottled, and being suffused over the dorsal portion of all the segments, except 9 and 10. Sub-lateral and ventral portions light green, except on segs. 1, 2 and 3, which are tinged with red. A whitish lateral line. Body covered with black setiferous warts, on which are set

thick tufts of short stout black hairs, those on seg. 10 much shorter than the rest. Legs green, edged with red. Prolegs banded, green and red. Head dark blackish, mottled, tapering gradually posteriorly and suddenly anteriorly from seg. 11. L. 8 m. m.

After 3d moult, July 20. Dull black above, yellowish beneath. A yellowish lateral line. Two yellowish dorsal patches on seg. 10, on which the hairs are short. Head blackish, with an anterior yellowish V-shaped mark. Legs greenish-yellow. Prolegs blackish. Seg. 11 much hunched. Form stout, much hunched in the region of segs. 2-4. L. 10 m. m.

After 4th moult, July 24. Black above, deeper anteriorly. A distinct yellow lateral band beginning on seg. 4 and running just below the stigmata, which are white, contrasting. Feet yellow. Prolegs black. Dorsal patches on 10 brighter, otherwise as in preceding stage. In some specimens the tufts on the segs. posterior to 3 and anterior to 11 are light smoky-brown, this peculiarity continuing through the last stage. (A similar variety occurs in the case of *A. luteicoma*, Grote.) L. 13 m. m.

After 5th moult, July 28. Lateral band orange colored. A broken yellowish stripe at base of legs. Two dorsal orange spots on 10, and in some specimens two smaller spots on 9. L. 19 m. m.

After 5th and last moult, August 1. Much as before, the setiferous tubercles large and rough, jet black, bearing thick tufts of short, stiff black hairs. Lateral band and dorsal spots dark red. Head and prolegs shining black. (Form as in *A. brumosa*, Guen.) L. 30 m. m. Cocoon between leaves August 9. Imago in May and June.

Although the moth is by no means rare, I have never before seen this larva during ten years collecting, although from its habits and color it is very conspicuous when feeding.

APATELA LUTEICOMA. G. & R.

Mature larva.—Blackish, with a reddish lateral band, as in the preceding species, though less distinct. Head shining black, with a few whitish hairs. Prolegs black. The tufting is somewhat peculiar. From the dorsal portion of 4 and placed transversely, project four very thick, smoky-black tufts of fine hair, and externally to these is a small, clear white tuft of similar hair. From the dorsal portion of seg 11, which is much hunched, project two long tufts of similar black hairs and externally to these are placed two white tufts, one on each side, as on seg. 4. On seg. 5 are six tufts, placed transversely on the dorsal surface, of similar fine white hairs. On seg. 3 are four similar tufts and also one each (sub-dorsal) on segs. 8 and 9. The four dorsal tufts of 2 also have a few of the fine white hairs at their bases. All the tufts above mentioned have a few longer, coarse black hairs mingled with the finer ones. On segs. 6-10, inclusive, four reddish tubercles placed

transversely on the dorsal surface from the edges of which project a few short whitish hairs, and from the central portions a few stout, short black hairs. There are two similar tufts on the anal segment. The remaining tufts are composed of long whitish hairs, very thickly set on the anterior segments and projecting forwards over head on seg. 1. Form stout, shape much as in the preceding species. L. 40 m. m. Cocoon between leaves or in rotten bark. Found in September on apple, cherry, walnut, oak, linden and ash. Easily recognized by the peculiar tufts. Rests by day on the trunk of its food plant.

APATELA AFFLICTA. *Grote.*

Mature larva. Light yellow-brown, tinged with green, darker superiorly. A few lateral whitish hairs. Stigmata white, ringed with black. A whitish stigmatal line; a distinct, continuous black dorsal line. A sub-dorsal row of stiff club-shaped hairs, such as are found in the larva of *A. funeralis*, but much smaller and not noticeable. These are easily broken and in the specimen before me are present only on segs. 4, 5, 6 and 11, though in more perfect specimens they may occur on all the segments. One specimen found was rich yellow-green, and all vary considerably in shade. Head yellow-brown, lighter externally, sparsely clothed with whitish hairs. Form stout, flattened posteriorly. Rests with head touching the posterior segments, selecting a withered or discolored leaf on which it is well concealed. Cocoon stout, elongated, spun among bark. Several specimens on red oak. Cocoon also under walnut. Spun September 17-25. Imago, June and July.

Of the species of *Apatela*, I am familiar with the larva of the following:

Vignula, *occidentalis* and *morula* on elm; *lobeliae* on oak; *fuscifera* on wild cherry; *Radcliffei* on wild cherry and apple; *funeralis* on hickory; *vulpina* on poplar and birch; *Americana*, maple, oak, walnut, linden, ash, sycamore; *dactylina*, alder and willow; *luticoma*, linden, ash, maple, cherry, apple, walnut, oak; *brumosa*, birch, willow, poplar; *noctivaga*, poplar; *afflicta*, oak, hickory (?); *clarescens*, apple, cherry; *hamamelis*, oak, chestnut; *xyliniformis* birch, blackberry; *oblinita*, button bush and various meadow plants; *lanceolaria*, a green larva, probably eating weeds, such as plantain, etc., found under a board at Cp. Neddock.

MAMESTRA GRANDIS. *Led.*

Mature larva.—Dull purplish, with obscure black and white mottling. Dull greenish ventrally. A broad, ill-defined light lateral band; an obscure dorsal streak and sub-dorsal lines. Four dorsal black spots on each segment, except 1-3 the anterior pair being more closely approximated than the posterior. A dark anterior shield on seg. 1 as in *Hadena*. Head light shining brown, somewhat mottled. Legs and prolegs dull greenish, the latter tipped with brown. A few short yellowish hairs on head and

body. L. 40 m. m. From eggs laid on burdock in July. Entered earth August 19.

PLUSIA CONTEXTA. *Grote.*

Eggs on grass, July 10. Somewhat flattened, much larger than those of *precatationis*, *ampla* and similar species, somewhat flattened, greenish-yellow. Hatched July 16.

Young larva—Light grass-green, on each segment are two transverse rows of large black warts, those of one row alternating with those of the other. From each of these warts projects a stout, curved black hair. Head light brown, mottled with black, and with a few black setiferous warts. Prolegs blackish, very slender. L. 4.5 m. m.

Before preparing for the first moult a row of dull scarlet spots appear, anterior to and including the sub-dorsal row of setiferous tubercles on all the segments, except I and II.

After 1st moult, July 20. Color as before. A white lateral and faint sub-lateral streak. Setiferous warts less distinct. Head with a few black setiferous tubercles. The red spots appeared as before, though less distinct. L. 9 m. m.

After 2d moult, July 20. Darker green. Two dorsal and one sub-dorsal white streak. A clear lateral white band. Setiferous tubercles less distinct, neither they nor the hairs they bear seem to increase after the first stage. Red spots before moulting scarcely visible. L. 14 m. m.

After 3d moult, July 25. Lateral band distinct cream-colored. Two dorsal and two sub-dorsal whitish streaks. The setiferous tubercles very small, only those on the head, the first three segments, together with a row situated just above the lateral line, are black. A semi-circular lateral row of black spots on head. L. 26 m. m.

After 4th moult, July 28. Lateral band more yellow. Dorsal ones more distinct. Indications of suffused dorsal yellow patches. Else as before. L. 30 m. m.

After 5th moult, July 31. Mature larva. Color light grass-green, darker inferiorly. A contrasting, creamy-yellow lateral band. Two dorsal and two sub-dorsal cream-colored lines, the former more distinct. A dull yellow, suffused dorsal patch, more or less distinct in different specimens, sometimes wanting on posterior 7 and anterior 8, extending nearly to the lateral line. A similar suffused spot is sometimes found on seg. 9, 10. Head green, with a few minute points and hairs. Slender, somewhat flattened. L. 45 m. m. Spun a slender, elongated white cocoon, pointed at both ends, August 4, changing to a pupa August 6, and producing the imago August 17, a period of thirty-eight days and a few hours, the eggs having been laid during the evening of July 10.

A brood of *Plusia Putnami*, *ampla* and *Epigæa* were brought through the third moult, but all died before completing the fourth

moult, except a few *Putnami*, which, at this stage could not be distinguished from *contexta*, unless, perhaps, by a slight, blackish dorsal shade. Their death seemed to be the result of two causes—bleeding through the rupture of the integument while shedding the skin, probably the result of too much moisture, and blackening, probably caused by some *fungus*. I have been somewhat troubled by entomophthrous fungi in rearing moths, especially by a species of *Entomophthura* allied to *radicans*, which attacks hairy caterpillars with great rapidity while feeding. Another mold has recently almost wholly destroyed a brood of *Ichthyura*, portions of the body blacking and producing a white mycelium, while the larvæ were still living, though unable to eat. I have not met with the species of *Torrubia*, except in the supposed conidial form. In addition to these I have found several species of *Mucor* and *Penicillium* very destructive among winter pupæ.

Of the *Plusia* above described, about ten imagos were obtained from a brood of several hundred. There are probably three or four broods of this species in a season, though there is little or no regularity in the appearance of the imago, as both this species and *Putnami* may be met with at any time from June to the middle of September. It is probable that a portion at least of the July broods of *Plusia* hibernate with the August and September broods, as the only survivor of my brood of *ampla* became torpid after the fourth moult and continued in this condition till the first of October, when it died. The following is a list of the species of *Plusia* that I have taken in this locality. *P. purpurigera*, *ærcoides*, *ærea*, *balluca*, *contexta*, *Putnami*, *formosa*, *mappa* (Isles of Shoals) *biloba*, *verruca*, *Dyaus*, *precatationis*, *laticlavata*, *u. auxeury* (?), *8-scripta*, *viridisignata*, *oxygramma*, *mortuorum*, *epigæa*, *ampla*, *simplex*.

NOTES ON THE GENUS CLISIOCAMPA.

BY R. H. STRETCH.

When at Astoria, Oregon, on the 17th of June last, I found the larvæ of two species of *Clisiocampa* infesting the orchards at that place, one of them excessively abundant the other in much smaller numbers. As we were traveling very rapidly and I had no opportunity for a week to examine and feed the larvæ I only succeeded in raising one of the species, and of that but few perfect specimens. I here give such notes as I have of their transformations.

Larva No. 1.—Similar to that of *C. Californica* in size and general appearance, but strikingly brighter colored. Length $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. Dark brownish-black. Prolegs black; abdominal

legs pale tawny at tips. Sides mottled with yellow, gathered into a broken lateral line along the upper edge of the yellow markings. Median dorsal line black, sometimes with a narrow, broken bluish line centrally, and a few spots of the same color just above the lateral yellow line on each segment. On each side of the blue dorsal line there is a mottled broken band of bright tawny yellow, the color most concentrated on the posterior part of each segment, thinly clad with pale tawny hairs. Beneath black, mottled with pale bluish-grey.

Varies by the expansion of the dorsal yellow markings so as to be strikingly yellow, or by their contraction so as to appear nearly blackish-brown. In this last case the blue markings become strikingly visible.

This species was only met with at Astoria, though diligent search was made for it at Portland and elsewhere. It was found feeding on the cherry, apple, currant, bramble and rose. A few on plum trees and on a tree allied to the hawthorn, none on the pear. It was most abundant in a badly-tended orchard; much less common in the one adjacent, where the plastering of the tree trunks with lime showed greater care and attention. The absence of larvæ in the same locality on July 31, shows the species to be probably single brooded.

The nests were long and narrow, very compactly and closely woven outside, so as almost to resemble a thin silken bag. Length about 12 inches, with a diameter of about 1.5 to 3 inches.

Larva No. 2.—Associated with the preceding on the apple trees, and found on the pear at Astoria, and cherry at Portland, a single larva being also found in the sweeping net at Yakima City, was a second very distinct form of which the following is a description.

A broad velvety-black dorsal line, narrowly edged with tawny, enclosing a few parallel tawny broken lines, and a dirty white ovate spot on the anterior part of each segment, those nearest the head being narrower than the others. Sides bluish-slate, palest above the feet, divided by a tawny lateral line, very faintly edged above and below with black. Prolegs black; abdominal legs slaty. Beneath slaty, with a large sooty-black spot on each segment on the dorsal line, those on the central segments being most conspicuous. A few short tawny hairs.

This species I unfortunately failed to rear, of No. 1 I raised two perfect ♂, and many cripples. Not having the types of *erosa* before me I cannot say if No 1 may be the larva of that species or not, but have forwarded the male to Mr. H. Edwards, who possesses the types of *erosa*, for comparison.*

San Francisco, August 9, 1882.

* The male alluded to by Mr. Stretch was certainly not his *Erosa*, but appears to me to be a new species. In this genus it is exceedingly difficult to distinguish the imagos.—HY. EDWARDS.

LIST OF NOCTUIDÆ TAKEN IN ORONO, MAINE,
AND VICINITY.

BY MRS. C. H. FERNALD.

Leptina Doubledayi, Guen. rare.	Agrotis fennica, Tausch. rare.
Pseudothyatira cymataphoroides, Guen.	" subgothica, Haw.
" var. expultrix, Gr.	" tricolor, Lintn.
Habrosyne scripta, Gosse. rare.	" herilis, Gr.
Audela acronyctoides, Walk. (1 ex.)	" plecta, Linn.
Charadra propinquinella, G. 1 ex.	" cupida, Gr.
" deridens, Guen. rare.	" brunneipennis, Gr. rare.
Raphia frater, Gr.	" alternata, Gr.
Feralia jocosa, Guen. very rare.	" clandestina, Harr.
Diphthera fallax, H-S. rare.	" messoria, Harris?
Apatela vinnula, Gr.	" scandens, Riley. rare.
" grisea, Walk. rare.	" atrifera, Gr. (2 ex.)
" occidentalis, G. & R.	" pitychrous, Gr.
" lobeliæ, Guen.	" versipellis, Gr. rare.
" morula, G. & R. 1	" campestris, Gr. rare.
" Radcliffei, Harv. rare.	" var. decolor, Morr.
" innotata, Guen.	" redimicula, Morr.
" Americana, Harr.	" geniculata, G. & R.
" dactylina, Gr.	" collaris, G. & R.
" luteicoma, G. & R. rare.	" perpolita, Morr. very rare.
" brumosa, Guen.	" fumalis, Gr. rare.
" noctivaga, Gr.	" mimallonis, Gr. rare.
" superans, Guen.	" tristicula, Morr. (only the type).
" clarescens, Guen.	" Fernaldi, Morr. very rare.
" hamamelis, Guen. rare.	" venerabilis, Walk.
" haesitata, Gr. very rare.	" volubilis, Harv.
" dissecta, G. & R.	" annexa, Tr.
" sperata, Gr.	" ypsilon, Rott.
" oblinita, A. & S.	" saucia, Hübn.
" lithospila, Gr. rare.	" lubricans, Guen.
Arsilonche henrici, Gr.	" rufipectus, Morr. rare.
" var. evanidum, Gr. (1 ex.)	" trabis, Gr.
Harrisimemna trisignata, Walk.	" pressa, Gr.
Microcoelia fragilis, Guen.	" prasina, Fabr.
" oblitterata, Gr.	" occulta, Hübn.
Bryophila lepidula, Gr. rare.	" astricta, Morr. rare.
Chytonix palliatricula, Guen. rare.	Anytus sculptus, Gr.
Agrotis chardinyi, Boisd.	Pachnobia salicarum, Barnst. rare.
" badicollis, Gr.	Fishia enthea, Gr. (2 ex.).
" janualis, Gr. rare.	Mamestra purpurissata, Gr. (1 ex.)
" opacifrons, Gr. very rare.	" nimbosa, Guen. (1 ex.)
" sigmoides, Guen.	" imbrifera, Guen.
" perattenta, Gr.	" latex, Guen.
" attenta, Gr. rare.	" adjuncta, Boisd.
" phyllophora, Gr.	" lubens, Gr.
" rubifera, Gr.	" legitima, Gr.
" conflua? Gr.	" lilacina, Harr.
" perconflua, Gr. very rare.	" var. illabefacta, Morr.
" Fishii, Gr. 2 ex.	" Goodellii, Gr. rare.
" baja, S. V.	" assimilis, Morr.
" Normauiana, Gr.	" rosea, Harv. rare.
" c-nigrum, Linn.	" congermana, Morr. rare.
" bicarnea, Guen.	" vindimialis, Guen. 2 ex.
" haruspica, Gr.	" picta, Harr.
" gularis, Gr.	" grandis, Boisd.
" turris, Gr.	" subjuncta, G. & R.

- Mamestra Atlantica*, Gr.
 " *Dimmockii*, Gr. rare.
 " *trifolii*, Rott.
 " *vicina*, Gr. rare.
 " *detracta*, Walk.
 " *olivacea*, Morr.
 " *lustralis*, Gr. rare.
 " *meditata*, Gr. rare.
 " *renigera*, Steph.
 " *lorea*, Guen.
 " *rugosa*, Morr. very rare.
Luceria passer, Guen. rare.
 " var. *conspicua*, Morr. (1 ex.)
Hadena ducta, Gr. very rare.
 " *devastatrix*, Brace,
 " *arctica*, Boisd.
 " *Bridghamii*, G. & R. rare.
 " *dubitans*, Walk.
 " *sputatrix*, Gr.
 " *suffusa*, Morr.
 " *apamiformis*, Guen.
 " *vultuosa*, Gr. rare.
 " *lignicolor*, Guen.
 " *verbascoides*, Guen.
 " *cariosa*, Guen.
 " *vulgaris*, G. & R.
 " *remissa*, Hübn.
 " *finitima*, Guen.
 " *impulsa*, Guen.
 " *leucoselis*, Gr. very rare.
 " *algeus*, Gr. very rare.
 " *vigilans*, Gr. (2 ex.)
 " *diversicolor*, Morr.
 " *mactata*, Guen.
 " *modica*, Guen.
 " *vulgivaga*, Morr.
 " *fractilinea*, Gr.
Oligia versicolor, Gr. (1 ex.)
 " *arna*, Guen.
Dipterygia scabriuscula, Linn.
Hyppa xylinoidea, Guen.
Valeria Grotei, Morr. 1 ex.
Homohadena atrifasciata, Morr. rare.
Dryobota stigmata, Gr. rare.
Actinotia ramosula, Guen.
Conservula anodonta, Guen. (2 ex.)
Trigonophora periculosa, Guen.
 " var. *V-brunneum*, Gr.
Euplexia lucipara, Linn.
Brotolomia iris, Guen.
Nephelodes minians, Guen.
 " var. *violans*, Guen.
Tricholita semiaperta, Morr.
Helotropha reniformis, Gr.
 " var. *atra*, Gr.
 " *sera*, G. & R.
Apamea nictitans, Behr.
 " var. *erythro stigma*, Haw.
Gortyna immanis, Gr. (1 ex.)
 " *iuquaesita*, G. & R.
Gortyna impecuniosa, Gr. very rare.
 " *purpurifascia*, G. & R.
 " *rutila*, Guen. rare.
 " *nitela*, Guen. very rare.
 " var. *nebris*, Guen. (1 ex.)
Achatodes zeae, Harr. (2 ex.)
Sphida obliquata, G. & R. rare.
Arzama diffusa, Gr. (2 ex.)
Macronoctua onusta, Gr. very rare.
Amolita fessa, Gr. rare.
Platysenta atriciliata, Gr.
Heliophila pallens, Linn.
 " *albilinea*, Hübn.
 " *amygdalina*, Harv. (only type)
 " *phragmitidicola*, Guen.
 " *adonea*, Gr.
 " *commoides*, Guen.
 " *unipuncta*, Haw.
 " *psedargyria*, Guen.
Caradrina miranda, Gr.
 " *multifera*, Walk.
Pyrophila tragopoginis, Linn.
 " *pyramidoides*, Guen.
Orthodes infirma, Guen.
 " *cynica*, Guen.
 " *enervis*, Guen. (2 ex.)
Taeniocampa thecata, Morr. rare.
 " *oviduca*, Guen.
 " *incerta*, Hübn.
Crocigrapha Normani, rare.
Morrisonia evicta, Gr. (1 ex.)
Anchocelis digitalis, Gr. (2 ex.)
Parastichtis perbellis, Gr.
 " *minuscula*, Morr. rare.
Orthosia ferruginoides, Guen.
 " *euroa*, G. & R.
Cosmia infumata, Gr. (1 ex.)
Homoglaea hircina, Morr. (2 ex.)
 " *carnosa*, Gr. (2 ex.)
Glaea inulta, Gr.
Epiglaea sericea, Morr.
 " *apiata*, Gr. (2 ex.)
Eucirroedia pampina, Guen.
Scoliopteryx libatrix, Linn.
Xanthia togata, Esper.
Scopelosoma Graefiana, Gr. (1 ex.)
 " *devia*, Gr. rare.
 " *Morrisoni*, Gr. rare.
 " *Walkeri*, Gr. rare.
Litholomia napaea, Morr. rare.
Lithophane disposita, Morr.
 " *petulca*, Gr. rare.
 " *ferrealis*, Gr. rare.
 " *signosa*, Walk. rare.
 " *Bethunei*, G. & R.
 " *fagina*, Morr. rare.
 " *Georgia*, Gr. rare.
 " *laticinerea*, Gr.
 " *cinerosa*, Gr. very rare.
 " *unimoda*, Lintn. very rare.

- Lithophane tepida, Gr. rare.
 " lepida, Lintn. (1 ex.)
 " pexata, Gr.
 " Thaxteri, Gr. rare.
 Lithomia germana, Morr. rare.
 Calocampa nupera, Lintn.
 " cineritia, Gr. rare.
 " curvimacula, Morr. rare.
 Cucullia convexipennis, G. & R.
 " asterioides, Guen.
 " intermedia, Speyer.
 " Speyeri, Lintn. rare.
 Crambodes talidiformis, Guen. (2 ex.)
 Nolaphana malana, Fitah.
 " Zelleri, Gr.
 Aletia argillacea, Hübn.
 Marasinalus histrio, Gr. (1 ex.)
 Telesilla cinereola, Guen.
 Abrostola urentis, Guen. rare.
 Deva purpurigera, Walk.
 Plusia aereoides, Gr.
 " balluca, Gey.
 " Putnami, Gr. rare.
 " striatella, Gr. very rare.
 " thyatiroides, Guen. (2 ex.)
 " mappa, G. & R. (1 ex.)
 " bimacula, Steph.
 " precatationis, Guen.
 " u-aureum, Boisd. ? rare.
 " mortuorum, Guen.
 " 8-scripta, Sanborn.
 " viridisignata, Gr. rare.
 " ampla, Walk. rare.
 " simplex, Guen.
 " Hockenwarthi, Hoch. (2 ex.)
 Anarta cordigera, Thunb. rare.
 Rhodophora florida, Guen.
 Lygranthoecia rivulosa, Guen.
 Pyrrhia exprimens, Walk. rare.
 " angulata, Gr. (1 ex.)
 Tarache erastrioides, Guen.
 " candefacta, Hübn.
 Lithacodia bellicula, Hübn.
 Chamyris cerintha, Tr.
 Eustrotia albidula, Guen.
 " concinnimacula, Guen.
 " synochitis, G. & R.
 " muscosula, Guen.
 " carneola, Guen.
 " apicosa, Haw.
 Euherrichia mollissima, Guen. (2 ex.)
 " monetifera, Guen.
 Brephos infans, Moeschl. rare.
 Drasteria erectea, Cram.
 Euclidia cuspidata, Hübn.
 Syneda Alleni, Gr. very rare.
 Melipotis limbolaris, Gey. (1 ex.)
 Catocala relictata, Walk.
 " var. Bianca, Hy. Edw. rare.
 " amatrix, Hübn. ?
 " concumbens, Walk.
- Catocala var. Diana, Hy. Edw.
 " unijuga, Walk.
 " briseis, Edw. rare.
 " parta, Guen.
 " coccinata, Gr. (1 ex.)
 " ultronia, Hübn.
 " ilia, Cram.
 " cerogama, Guen.
 " } communis, Gr.
 " { neogama, Ab. & Sm. ? rare,
 " antinympa, Hübn.
 " coelebs, Gr.
 " crataegi, Saund.
 " gracilis, var. sordida, Gr.
 Pseudolimacodes littera, Guen. (1 ex.)
 Parallela bistriaris, Hübn.
 Panopoda rufimargo, Hübn. (1 ex.)
 Erebus odora, Linn. (1 ex.)
 Zale horrida, Hübn.
 Homoptera edusa, Drury.
 " minerea, Guen.
 " Woodii, Gr. rare.
 " duplicata, Beth. rare.
 Ypsia undularis, Drury. rare.
 Pseudanthroecia coracias, Guen.
 Homopyralis tactus, Gr.
 Spargaloma sexpuncta, Gr. rare.
 " umbrifascia, Gr. rare.
 Pangrapta decoralis, Hübn.
 Pseudaglossa lubricalis, Gey.
 Epizeuxis aemula, Hübn.
 " americalis, Guen.
 Megachyta lituralis, Hübn.
 " deceptricalis, Zell.
 Litognatha nubilifascia, Gr.
 Chytolita morbidalis, Guen.
 Zanclognatha laevigata, Gr.
 " cruralis, Guen.
 " marcidilinea, Gr.
 " minimalis, Gr.
 Pallachira bivittata, Gr. (1 ex.)
 Philometra longilabris, Gr.
 " serraticornis, Gr.
 Rivula propinqualis, Guen.
 Paithis angulalis, Hübn.
 Phalenophana rurigena, Gr.
 Capis curvata, Gr. rare.
 Remia alutalis, Gr. (1 ex.)
 " restrictalis, Gr. rare.
 " Belfragei, Gr.
 Bleptina caradrinalis, Guen.
 Lomanaltes laetulus, Gr.
 Hypena baltimoralis, Guen.
 " scutellaris, Gr.
 " manalis, Walk. (1 ex.)
 " bijugalis, Walk.
 " abalienalis, Walk..
 " toreuta, Gr. (1 ex.)
 " evanidalis, Robs.
 " scabra, Fabr.
 Eulintneria bifidalis Gr

NOTES ON THE EARLY STAGES OF SOME HETEROCERA.

BY HENRY EDWARDS.

CLOSTERA INCLUSA. *Hbn. Young larva.*

Head black, shining, with double fovea in front. Second segment edged in front with bright yellow. Body black, with a series of bright yellow longitudinal stripes, those of the dorsum being the most distinct: 4 and 11 have small black tubercles in the centre. All the segments bear small jet black piliferous tubercles. The hairs of the body are all sordid white. Anal segment black. Under side dull yellow. Feet black at the tips.

Length (after first moult) 18 m. m.

Feeds in companies until after the second moult, the larvæ then separate and act independently of each other.

THYRIDOPTERYX EPHEMERIFORMIS. *Steph. Young larva.*

Head, 2d, 3d, 4th and anal segments pitchy, the rest of the body being dull smoky gray. Thoracic legs pitchy, concolorous with the anterior segment. Abdominal legs aborted, concolorous with posterior segments. After about six hours exclusion from the egg they begin to form their baskets of whatever material may be at hand, and do not appear to eat until the first basket covering is found. They are particularly active little creatures, and move very swiftly, with the posterior segments erect.

CATOCALA PARTA. *Guen. Larva. (Full grown.)*

Dull fawn color. Head, as in all the genus, flattened on the top, with deep frontal sinus. A black line surrounds the head, except at the junction with the second segment. There is a pale brownish dorsal line, and a sub-dorsal one, slightly waved, on each segment, and enclosing a darker space. These lines are most apparent at the junction of the segments. A rather broad, brownish lateral line, slightly waved, encloses the spiracles, which are brown. Feet and legs concolorous with the body. At the extreme lateral edge is a row of short sharp ciliæ.

Length 2.80 inch.

Willows. (A. W. P. Cramer.)

DEPRESSARIA HERACLIANA. *De Geer.*-ONTARIELLA. *Bethune. Larva. (Full grown.)*

General color pale yellowish-gray, with a deeper yellow cast along the sides. Head and forepart of the second segment jet black, shining. On 3 and 4 are eight rather large black shining tubercles and two smaller ones, the latter placed dorsally. On the other segments the tubercles are all of the same size, arranged eight in front of and around the segment, the remaining two upon the dorsum. The thoracic legs are jet black, the abdominal concolorous with the body, with black ring at their base.

Length 18 m. m.

Feeds upon the flowers and seed vessels of *Archangelica atropurpurea*, L. But after passing through its last moult it burrows into the stems of the plants, feeding upon the pith.

Larvæ captured July 1. Last moult July 4. Burrowed into stem July 6. Changed to chrysalis July 8. Imagos emerged July 16-19. I am indebted to Mr. Vanwaggenen, of Rye, Westchester county, N. Y., for my knowledge of this species.

NOTES ON LEPIDOPTERA.

SPHINX SEQUOIÆ. Bdv. I recently received from my friend, Mr. R. H. Stretch, of San Francisco, several examples of this very rare Sphinx, taken by him in Butte county, California, in July last. They were all captured at night, flying about the light of an electric lamp. As far as I am aware only three examples of the species were previously known to exist in collections.

HY. EDWARDS.

RARE LEPIDOPTERA IN NEW JERSEY. Every year some scarce species are taken in this State, and Mr. B. Neumoegen appears to have been more than fortunate during the past season. His captures include among others *Melitæa Phaeton*, *Limenitis Ursula*, aber. *Feniseca Tarquinius*, *Thecla strigosa*, *Thecla Nippon*, *Papilio Cresphontes*, *Pamphila Pontiac*, *P. Massas it*, *Hemaris axillaris*, *H. Floridaensis*, *H. Buffalensis*, *Thyreus Abbottii*, *Cressonia juglandis*, *Melittia Ceto*, *Bembecia marginata*, *Fatua denudata*, *Ægeria albicornis*, *Thyris lugubris*, *Euchætes eglensis*, *Parorgyia leucophaea* P., *Clintonii*, *Lagoa crispata*, *Euclea querceti*, *E. ferruginea*, *Parasa chloris*, *Monolena semifascia*, *Phobetron pithecium*, *Limaçodes rectilinea*, *L. fasciola*, *Adoneta Spinuloides*, *Apatelodes torrefacta*, *Notodonta stragula*, *Edema albifrons*, *Cedemasia concinna*, *Ce. eximia*, *Ce. badia*, *Coelodasy leptinoides*, *Heterocampa biundata*, *Dryopteris rosea*, *Tolype laricis*, *Xystus Robinia*, and many rare Noctuæ. The locality examined was in the vicinity of Morris Plains.

HY. EDWARDS.

ASILUS AND GEOMETER. While collecting in July last in the neighborhood referred to in the preceding paragraph I came upon a large colony of the pretty Geometrid moth, *Aspilates dissimularia*, Guen, and was astonished and interested to see the persecution to which it was subjected by a large species of *Asilus*. The moths were very abundant, and as they rose out of the low bushes through which I walked, each specimen was followed by an *Asilus*, which appeared to be constantly on the watch. If the moth took refuge in the lower branches of the bushes the dipterous tiger followed and hunted the leaves and twigs as a terrier hunts a cover for a rabbit. The poor moth on being approached too closely by its tormentor would take wing, but was instantly followed and, in most cases, seized by its insatiate enemy, borne to the nearest resting place, and immediately killed. I captured some of the *Asilus* the moment the moth was seized, but in all cases death appeared to have ensued at once, the point of attack being the thorax of the *Aspilates*. One specimen of *Asilus* observed by me destroyed no less than eight of the moths in about twenty minutes, apparently only sucking the juices, and discarding the rest of body as soon as this operation was performed.

HY. EDWARDS.

TOLYPE LARICIS. Lintn. While strolling about the lower falls of the Genesee yesterday I found six cocoons of *T. laricis* on the white pine. (*P. Strobus*). To-day I have a fine pair of moths from them, and think it worthy of record that the species is found elsewhere than on the larch, (*Larix Americana*) as the latter species does not grow where the cocoons were found.

H. ROY GILBERT, Rochester, September 4, 1882.

NEW METHOD OF FEEDING LARVÆ. I believe I have made a discovery by which larvæ may be kept and reared on food prepared so as to last through

the whole series of changes. I record my experience with those of *Papilio cresphontes*. The eggs were found on *Ptelea trifoliatum*. They hatched on October 9, so that they must have been deposited some seven days earlier. They reached their moults as follows: 1st stage, 16th to 18th; 2d, 23d to 25th; 3d, 30th to 31st; 4th, November 10th to 13th; 5th, or pupa, December 11th to 13th, at which time the weather was extremely cold, occasionally 15° below zero. The duration of the changes, 72 days. My method was to gather the leaves of the plant in summer, press them quite dry in a book or under weights as in botanical specimens, and, when feeding my larvæ, soak them all night in pure water, causing them to appear fresh and in growing condition. The larvæ preferred these soaked leaves to the fresh ones of oranges obtained from a greenhouse, though they would feed sparingly upon the latter when driven to it by hunger. I have also tried the experiment of soaked leaves with great success upon *Apatura clyton*. I trust this brief account of an interesting experience may be useful to lepidopterists, as eggs of species may be sent from any distance, accompanied by dried food plants, and the results will surely be satisfactory. The leaves must be kept in the dark, or the green color fades out and the flavor is destroyed.

A. H. MUNDT, Fairbury, Ill.

LIMENITIS URSULA AND L. DISIPPUS. I have expressed my opinion to Mr. W. H. Edwards that these forms arise from the same brood. At three different times I gathered eggs and larva from a willow in my yard, and each time (all hatching within a few days of each other) some produced *Disippus*, and some *Ursula*. I could not perceive the smallest difference in the larva or pupa. The imagos I raised would not lay in confinement, so I was not able to pursue the investigation further.

A. H. MUNDT, Fairbury, Ill.

MELITÆA CHALCEDON. Bdv. This species hibernates socially after the first moult, selecting a place below the radical leaves of cumbrous herbage, from which situation the larvæ do not stir for several months. I have kept them all the winter, and could not induce them to eat, but when they began to move about, they devoured the food-plant with great eagerness. Berkeley, Cal.

J. J. RIVERS.

ÆGERIA HEMIZONÆ. Hy. Edw. I have reared this species from the larva, a pallid grub with a darker head, feeding in the roots, rhizome, or base of the canes of the cultivated raspberry, and devouring the pith therein. This is looked upon by fruit-growers as a direful insect, killing the plant, root and branch, but the injury is not so great as supposed. The larva feeds only on the pith, the loss of which is not immediately fatal, even to the part affected, much less to the whole. I have observed these Ægerian larvæ always in otherwise unhealthy plants, such as are infested with "scale," and mostly with the tumors of the "woolly aphid" upon their roots. This last condition is usually accompanied by bad cultivation.

J. J. RIVERS, Berkeley, Cal.

PAPILIO CRESPHONTES. Cr. During the past year this species seems to have made its appearance throughout the country in large numbers and in localities hitherto unknown. From Wisconsin, Northern New York, Maine, Massachusetts, Connecticut and Illinois come reports of numerous captures, and many entomologists have been engaged in carrying through their various stages the handsome larvæ of this interesting insect. It is to be hoped that careful observations may be kept so that the perfect life-history of the species may be made known.

HY. EDWARDS.

HYPHANTRIA TEXTOR AND H. CUNEA. I know these forms are generally regarded as belonging to one species, but the larvæ differ considerably in color and markings. Those of the latter do not make a web like those of *H. textor*, they are larger and feed also upon a different plant. The differences in the imago are very striking, the body in *H. cunea* being yellow and black, while in *H. textor* it is wholly white. Has any observer raised broods of the two forms?

N. COLEMAN, Berlin, Conn.

PAPILIO.

Organ of the New York Entomological Club.

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[No. 2.

LIST OF LEPIDOPTERA COLLECTED JULY, 1882,

BY W. W. HILL, Albany, N. Y.

All of these examples were captured at an average altitude of 2200 feet, in the heart of a dense forest, composed principally of balsam, spruce, pine and birch, at the foot of Mount Marcy, the highest peak of the Adirondacks and seven miles by trail and "blazed" line from its summit. Species marked thus * were netted during the day time. All of the remainder were captured inside of the Adirondack Lodge at night, being attracted by light. No sugaring was done.

RHOPALOCERA.

Papilio Turnus. L. 12 ♂ 1 ♀ *. Perfect examples were observed on summits of Marcy, 5344 feet, and McIntyre, 5112 feet.

Argynnis Atlantis, Edw., ♀, *.

Vanessa Antiopa (L.), ♀, *.

Limenitis Arthemis (Drury), 58 ♂-75 ♂

HETEROCCERA. SPHINGIDÆ.

Everyx Chœrilus (Cram.), ♂.

Smerinthus geminatus, Say, ♂.

Paonias excæcatus, A. and S., 2 ♂.

Calasymbolus myops, A. and S., ♂.

Cressonia juglandis, A. and S., ♂.

BOMBYCES.

Euphanessa mendica (Walk.), ♀.

Crocota ferruginosa, Walk., 2 ♂.

Platartia parthenos, Harr., ♀, July 26.

Arctia Saundersii, Gr., ♂.

Nadata gibbosa (A. and S.), ♂.

Lophodonta ferruginea, Pack., ♂.

Cœlodasys unicornis, A. and S., ♂.

Platypteryx arcuata, Walk., 2 ♂-2 ♀.

Dryopteris rosea, Walk., ♂-♀.

" *irrorata*, Pack., ♂-♀.

Hepialus furcatus, Gr., 4 ♂-♀.

NOCTUÆ.

- Pseudothyatira cymatophoroides* (Guen.), ♂.
 “ “ var. *expultrix* Gr., 39 ♂-9 ♀.
Habrosyne scripta (Gosse), 14 ♂-♀.
Apatela innotata (Guen.), 2 ♀.
 “ *hamamelis* (Guen.), ♀.
Microcœlia fragilis, Guen., ♀.
Chytonyx palliatricula (Guen.), 2 ♀.
Agrotis perattenta, Gr., 2 ♀.
 “ *rubifera*, 3 ♀.
 “ *pecta* (L.), 3 ♀.
 “ *clandestina* (Harr.), 20 ♂-11 ♀.
 “ *prasina*, Fabr., 3 ♀.
Mamestra imbrifera, Guen., ♂ ♀.
 “ *adjuncta*, Boisd., ♂.
 “ *loreæ* (Guen.), 2 ♂.
Hadena arctica, Boisd., ♂.
 “ *vultuosa*, Gr., 4 ♀.
 “ *lignicolor* (Guen.), ♀.
 “ *remissa*, Hübn., ♀.
 “ *impulsa*, Guen., ♀.
Hyppa xylinoides, Guen., ♂-5 ♀.
Trigonophora periculosa, Guen., ♂.
Euplexia lucipara (L.), 3 ♀.
Caradrina Miranda, Gr., ♀.
Orthodes cynica, Guen., ♀.
Cucullia postera, Guen., ♀.
Aletia argillacea, Hübn., ♂.
Plusia æreoides, Gr., ♀.
 “ *mappa*, G. & R., ♂ July 25 ; 2 ♀ July 26.
 “ *u-aureum*, Bd., 21 ♂-15 ♀.
 “ *mortuorum*, Guen., 23 ♂-25 ♂.
 “ *octoscripta*, Sand., ♀.
 “ *ampla*, Walk., 2 ♂-2 ♂, July 25 to 30.
Eustrotia albidula (Guen.), ♀.
Pseudoglossa lubricalis (Gey.), 4 ♀.
Epixeuxis æmula, Hübn., 4 ♂.
Megachyta deceptricalis (Zell), ♀.
 “ *inconspicualis*, Gr., 5 ♂ ♀.
Zanclognatha cruralis (Guen.), ♂.
 “ *marcidilinea*, Gr., ♀.
 “ *minamalis*, Gr., ♂-5 ♀.
Rivula, N. S., ♂.
Palthis angulalis, Hübn., 4 ♂-♀.
Hypena Baltimoralis (Guen.), ♂-♀.
 “ *scabra*, Fabr., 2 ♂-66 ♀.

GEOMETRIDÆ.

- Endropia obtusaria*, (Hübn.), 3 ♂-♀.
 “ *armataria*, (H. S.), ♂-2 ♀.
Metrocampa margaritata, L., 2 ♂-♀, *, in deep woods.
Anogoga pulveraria (L.), ♀.
Angerona crocalaria (Fabr.), ♂-2 ♀.
Nematocampa filamentaria, Guen., ♂.
Acidalia inductata, Guen. ♂.

- Callizzia amorata*, Pack., 2 ♂-2 ♀.
Deilinea variolaria, Guen., ♂ ♀.
 " *erythemaria*, Guen., 3 ♀.
Macaria granitata, Guen., 4 ♂-6 ♀.
Caripeta divisata, Walk., 5 ♂-♀.
Cymatophora umbrosaria, Hübn., 5 ♂-4 ♀.
 " *larvaria*, (Guen.), 6 ♂-2 ♀,
Paraphia subatomaria, Guen., ♀.
Baptia albovittata, (Guen.), 6 ♂-♀.
Phibalapteryx latirupta, Walk., ♂-♀.
Rheumaptera ruficillata, (Guen.), ♀.
 " *basaliata*, (Walk.), 2 ♂-♀.
 " *fluctuata*, (L.) ♂-5 ♀.
 " *lacustrata*, (Guen.), ♀.
 " *hasitata*(L.), 57 ♂-18 ♀. in great variety.*
 A very few taken at light.
Ochyria abrasaria, H. S., 2 ♂-4 ♀.
Petrophora truncata (Hübn.), 6 ♂-2 ♀.
Epirrita cambricaria, H. S., 2 ♂-4 ♀.
Glaucopteryx cumatilis (G. and R.), ♀.
 " *cæsiata* (Borkh.), 2 ♂.
Eupithæcia ———, 5 examples too much worn for determination.

PYRALIDÆ.

- Aglossa domalis*, Guen., ♂.
Asopia devialis, Gr., 3 ♂-4 ♀.
 " *squamealis*, Gr., ♂.
Botis erectalis, Gr., ♂.
 ' *maquistralis*, Gr., ♂.

TINEIDÆ.

- Cryptolechia Schlægeri*, Zeller, ♀.

The following captures made by me in the Adirondacks have lately been described in the *Canadian Entomologist*, the types being in my collection.

- Agrotis hospitalis*, Gr., 2 ♀, July, 1880.
Anytus sculptus, var. *planus*, Gr., ♀, September 4, 1878.
Rheumaptera immediata, Gr., ♀, June 21, 1878; ♀, July, 1880.

ON STIRIA, WITH NEW GENERA AND SPECIES OF NOCTUIDÆ.

BY A. R. GROTE.

In the present paper I describe several forms of North American Noctuidæ, from East and West, which are among the most interesting I have yet discovered. The types are almost all contained in Mr. Neumoegen's large collection, which I have been recently studying. Perhaps the most notable of all here described is *Mamestra Bella*, taken by Mr. Neumoegen himself in New

Jersey, and which proves that we have yet fine species in the East undescribed. That it has a near ally in the European fauna makes the discovery more valuable.

TRICHOCLEA. n. genus.

Eyes hairy, lashed. Front with a protuberance concealed by the short, close scales; globose, clypeal plate prominent. Palpi moderate, third article distinct, oblique. Tongue well sized. Tibiæ unarmed. Body untufted. Male antennæ ciliate, simple. Aspect of *Carneades*. Looks like a small *Mamestra Trifolii*. Care must be taken to distinguish this from very similar forms, differing structurally, from the same locality.

TRICHOCLEA DECEPTA. n. s.

♂ ♀. Carneous gray. Claviform and reniform, shaded with blackish lines faint, double, marked on costa. Stigmata small, concolorous. Hind wing white, with a smoky border broadest in ♀, and in this sex with a dotted mesial line before it. Beneath yellowish-white, with dots and extra mesial line more or less marked. Head and thorax like forewings, abdomen a little paler. The t. p. line is denticulate, followed by pale points; the sub-terminal field is unprominently darker shaded. A terminal dotted line. Fringe finely cut with pale. Thorax and head unmarked.

Expanse, ♂ 27, ♀ 32 mil. Three specimens. Arizona.
Coll. Mr. Neumoegen.

CARNEADES MOERENS. *Grote*.

Other ♂ ♀ specimens lately examined are more reddish than my type. This species must be examined under the microscope and its structure verified to make sure of the identification. The average expanse seems to be 28 mil. The insect has a slight resemblance to *Agrotis Citricolor*, but is faded ochrey, with a reddish cast; the terminal space darker. The genus agrees well with *Agrotis*, but may be quickly separated by the structure of the clypeus, which has a navel-shaped protuberance. The single species is dull and inconspicuous in color and markings. It was taken by Mr. Morrison in Arizona.

MAMESTRA BELLA. n. s.

Rich blackish-brown; sub-terminal line narrow, contrasting, yellowish, with a sub-costal shallow rounded projection, thence even, rounded to internal angle. Lines black, double. Claviform black, outlined in velvety-black. Orbicular pale, ringed with dark-shaded centre, ovate, somewhat oblique. Reniform opposedly-oblique, narrow, dark, with incomplete pale ring behind. Cuneiform black marks before the s. t. line inferiorly. Fringes dark, very finely cut with pale. Head and thorax greenish-brown. Hind wings fuscous, paler at base, with discal mark and faint mesial line. Eyes hairy. Ovipositor exerted. Be-

neath paler, irrorate; hind wings with discal mark and double exterior bands.

Expanse 30 mil.

New Jersey. Coll. B. Neumoegen, Esq.

Resembles the European *Dianthocia Cucuballi*. One of the prettiest of our Eastern species. The t. p. line is scalloped and rather strongly projected opposite the cell. Darker than the European species, and differing considerably in detail.

UFEUS SAGITTARIUS. n. s.

Red brown, with a slight mixture of pale scales. No lines on primaries. On the cell a pale yellowish streak, which joins the curved, similarly colored, linear, bow-shaped reniform. Hind wings pale, concolorous, yellowish fuscous; beneath with a thick trigonate black discal mark. The reddish fringes of primaries finely cut with pale.

Expanse, 40 mil.

Coll. B. Neumoegen, Esq. California.

This new species is very simply marked. The wings beneath are pale, discolorous, and are notable from the want of discal mark on fore wings, and the presence of the thick spot on hind wings. Head and thorax concolorous with primaries,

TRICHORTHOSIA. n. g.

Eyes hairy, lashed. Thorax untufted. Vestiture hairy, loose. Fore tibiæ unarmed; middle and hind tibiæ spinose. Palpi rather short, third joint conical. Tongue rather weak. Abdomen untufted. Fore wings with straight costal and full outer margin; apices sharp. Allied to *Xanthia* in shape of wings; differs from all the genera allied to *Orthosia* by its structure.

TRICHORTHOSIA PARALLELA. n. s.

Ochrey olive; terminal field white-shaded, contrasting, limited inwardly by the rigid, double, sub-terminal line, its inner component line thicker and not continued at apices. Reniform red-stained with inferior black dots; orbicular a dark dot. Ordinary lines double, faint. Hind wings fuscous, with pale fringes.

Expanse, 28 mil.

New Mexico. Prof. Snow.

ORTHODES NITENS. n. s.

♂ ♀. Silky reddish-brown, the male smaller and brighter-colored. The lines marked by double lines on costa, hardly to be made out, except in certain lights. Subterminal line a tolerably distinct succession of black points. Reniform small, white, contrasting, lying partly in the evident black angulated median shade. Fringe a little darker than the wing. Thorax concolorous. Hind wings and abdomen fuscous; fringe somewhat reddish. Beneath

secondaries paler, irrorate, with distinct discal mark and diffuse band. Anal tuft of male ochreous.

Expanse ♂. ♀ 29 mil,
Kittery Point. Mr. Thaxter.

This species may go under one of the names proposed by Guenée in this genus, but it fits no one of his descriptions. It does not seem to vary, and I do not believe it has been before described.

TÆNIOCAMPA PEREDIA. n. s.

♂ ♀. Eyes hairy; body untufted; vestiture hairy; size small; allied to *Furfurata*. The color is more rusty ochrey and the wing is more speckled with dark, blackish points and shades. T. p. line marked by black dots. Median shade rather dark, diffuse, prominent. Orbicular spherical, entirely of the paler ground color; reniform with a central streak and black inferior dot. T. a. line, sub-continuous, double; inner line indistinct, waved. Head and thorax of the paler rusty ochrey ground color of fore wings; collar sometimes lined. Hind wings paler in male, pale fuscous, with contrasting paler fringes and discal mark. Beneath dirty-whitish; a very distinct terminal dotted line; discal mark and blackish sub-punctate extra-mesial line. Abdomen pale fuscous with ochrey anal hairs.

Expanse, 27 mil.

Kittery Point, Maine. Mr. Thaxter.

With the discovery of new Western forms since the publication of the "New Check List" I would now arrange the two groups, which I call *Calpinæ* and *Stiriinæ*, as follows:

CALPINÆ.

CALPE, *Tr.*
Canadensis, *Beth.*
HYPBOROPHA, *Hubn.*
MONILIS, *Hubn.*
HORMOS, *Hubn.*

HEMICERAS, *Guen.*
Cadmia, *Guen.*
PHIPROSOPUS, *Gr.*
CALLITRICHOIDES, *Gr.*
PLUSIODONTA, *Guen.*
COMPRESSIPALPIS, *Guen.*

STIRIINÆ.

BASILODES, *Guen.*
Pepita, *Guen.*
Chrysophis, *Gr.*
STIRIA, *Gr.*
Rugifrons, *Gr.*
Sulphurea, *Newm.*
PLAGIOMIMICUS, *Gr.*
Pityochromus, *Gr.*
Expallidus, *Gr.*
Tepperi, *Morr.*
NEUMOEGENIA, *Gr.*
Poetica, *Gr.*

STIBADIUM, *Gr.*
Spumosum, *Gr.*
Aureolum, *Hy. Edw.*

FALA, *Gr.*
Ptycophora, *Gr.*
ACOPA, *Harvey.*
Carina, *Harv.*
Perpallida, *Gr.*
Incana, *Hy. Edw.*

Then follows, as in my "List, the *Plusiinæ*, commencing with *Telesilla*. The *Heliothinæ* follow *Plusia*, commencing with *Anarta*, as in my "List," the only change being in the genera of the *Stiriinæ* being transferred to before *Plusia*; the change of the posi-

tion of the genera *Anarta* and *Lepipolys*, proposed in the appendix, being rendered unnecessary. The relationship of *Basilodes* to *Stiria*, *Plagiomimicus* and *Stibadium* had escaped me, but I feel sure that I am correct in placing *Pityochromus* and allies with *Stiria* rather than with *Lygranthæcia* or *Schinia*, from the structure of the thorax, which is very similar in all these forms and quite different from the *Heliothinæ*. Any one who has these species, and will so arrange them, cannot but so agree with me, both as to the validity of the genera and the naturalness of this arrangement.

The species noticed in this Paper are as follows :

- Trichoclea Decepta.* Grote, n. s.
- Carneades Mocrens.* Grote.
- *Mamestra Bella.* Grote, n. s.
- Ufeus Sagittarius.* Grote, n. s.
- *Tricorthosia Parallela.* Grote, n. s.
- *Tæniocampa Peredia.* Grote, n. s.
- *Orthodes Nitens.* Grote, n. s.

NEW FORMS OF THE GENUS ALYPIA.

BY HENRY EDWARDS.

ALYPIA MATUTA. n. sp.

The species figured by Abbot and Smith, p. 87, pl. 44, is certainly not the well-known *A. octomaculata*, *F.* to which it is referred by the above authors. A comparison of the figure of the larva with that of *A. octomaculata* will support this view, as that given by A. and S. is wholly bright lemon-yellow, with waved transverse lines of black, and with black spines. Several examples of the imago exactly agreeing with Smith and Abbott's figure have passed through my hands, and I venture to describe this form by the above name, believing it to be abundantly distinct in all its stages from the common species. The spots are considerably larger and differ much in shape from those of *A. 8. maculata* the basal spot of which, in the primaries, is either rounded or ovate, the outer one also ovate, with the edges even. In the present form the basal patch is sub-triangular in outline, straight along its internal margin, somewhat rounded costally, and terminating towards the base of the wing in a fine point on the median nervule. The outer patch is ovate, but with its anterior edge irregular in outline and somewhat constricted in the middle. The secondaries have the basal third pure white, not in any way interrupted by black, and the outer spot is much larger and more pyriform in shape than in *A. 8. maculata*. On the lower

side the markings are repeated, the pale yellow patches of the primaries being united by a narrow yellow band.

Colorado, Missouri, Alabama.

Coll. E. L. Graef, F. Tepper, Hy. Edwards, B. Neumoegen.

This form is easily distinguished from *A. s. maculata* by the utter absence of black at the base of the secondaries. In the ♀ of the well-known species the white basal patch of secondaries is sometimes nearly as large as that of *A. matuta*, but the extreme base is, as far as my examination of examples has shown, always black.

ALYPIA WITTFELDII. n. sp.

Size and form of *A. octomaculata*, to which it is closely allied. The primaries are, however, narrower than in the common species, and considerably more produced at the apices. The spots are much darker in color, being a light buff, instead of pale primrose yellow, and in strong contrast with the clear white spots of the secondaries. They are also different in shape, the inner one, which in the well-known species is nearly ovate, being here an imperfect oblong, and reaching nearly across the wing from the sub-costal nervure close to the internal margin. The outer spot is pyriform and much larger than the corresponding mark on any examples I have seen of *A. octomaculata*. The clear white spots of the secondaries are also small, the outer ovate, the inner oblong ovate. Base of the wing and abdominal margin broadly black in both sexes. Beneath the markings are repeated. The collar, tegulae, palpi, and legs as in *A. octomaculata*.

1 ♂, 2 ♀. Indian River, Fla.

Coll. B. Neumoegen, Hy. Edwards.

I have dedicated this species to the discoverer, Dr. W. Wittfeld, who has done much to make known the existence in Florida of many rare species of Lepidoptera, as well as of others not previously recorded in our lists.

ALYPIA SIMILIS. *Stretch*.

N. VAR. CONJUNCTA.

In this form, which is apparently very rare, the yellow discal spot of primaries is joined to the triangular basal patch, giving a much paler appearance to the insect and suggesting the idea of a distinct species. The outer pyriform band of secondaries is also a little larger and nearer the margins of the wing. In all other respects the same as *A. similis*.

2 ♂. Contra Costa County, California.

Type. Coll. Hy. Edwards.

A BRIEF ESSAY ON CLASSIFICATION OF THE HETEROCERA.

BY A. R. GROTE.

A recent criticism upon the genera, which I have established in the *Noctuidæ* runs to the effect that I have regarded all modifications of structure as of generic value. This criticism loses force when we see that its author adopts seventy-five of my genera in the family and rejects but very few of my generic names for this reason. Since it appeared I have published many additional genera, so that in the *Noctuidæ* alone I have now described upwards of one hundred. It is important that the structural differences which have induced me to establish these genera should be discussed, and I, therefore, state that I have studied the following characters:

1. The *Head*, the structure of the compound eyes, presence of ocelli, form of tongue and palpi, width and appearance of the front, structure of the antennæ.

2. The *Thorax*, shape of collar, patagia, comparative shape of wings, structure of the wings, neuration, structure of the feet, especially of the fore tibiæ.

3. The *Abdomen*, comparative length and shape (consult my Illustrated Essay, p. 31, et seq.). Added to these, the vestiture of the whole insect has usually been studied and gives good characters. The tuftings of the body and the nature of the squamation, whether of scales like hairs, or flattened, or a mixture of these, or, again, of what I call "flattened hairs," intermediate in width, must be fully noted.

However low a character the neuration may be regarded by some writers on Lepidoptera, it is, at the last made the test of family distinction by Herrick-Schaeffer and modern authors generally. Although, as I showed many years ago, in some forms, e.g. *Thyridopteryx*, the neuration differs in opposite wings of the same individual, or, again, separates two species, otherwise closely related, such variation concerns merely the branching of certain nervules, and does not affect the general pattern, the relative distance of the two principal veins from each other, and the number of branches belonging to each. Thus, to some extent, the neuration affords only a variational or specific character; in another view it gives generic and even family criteria. In other words it is not different from the balance of characters used in classification; the *amount* and *extent* of the peculiarity gives the value. Every well-marked variation and modification of structure, which can be clearly made out, by the microscope or otherwise, is of generic value. The moment this rule is departed from we are thrown upon "opinions." Certain struc-

tural features are not to be considered "well-marked," as, for instance, the ordinary range of antennal peculiarity, slight changes in shape of wing, tibial armature, etc. In fact *all* the characters which, when *well-marked*, are of generic importance, are liable to slight modifications which are only specific. It is the *kind, constancy* or *amount* of these modifications which decides the class in all our artificial divisions of these natural objects. This really decides *individuals, varieties, aberrations, species, sub-genera, genera, sub-families, families, sub-orders, orders* and *classes* throughout the animal kingdom.

In the antennæ of moths the range of variation is so great that it is only upon an unusual departure (e.g., *Renia*) that we can use them as generic characters. They are different in the sexes, and here we come upon the question of secondary sexual characters. It is clear that when the departure of one sex is as strong as usually demanded by generic differences, we should use a distinct title. Such genera are not equal to ordinary genera, where the characters are shared by both sexes; but neither are all *species* equally strongly distinct. Just as on a former occasion I drew attention to certain assemblages which I called PRO-GENERA, of which *Datana* is an example, so here I call such genera as are founded on peculiarities shown oftenest by the male sex, ANTIGENIC. The genus *Heliochilus* is a case in point.

Here we have such an unusual structure of δ wing that it has but but few parallels in the Sub-order. *Euscirrhopterus* is another case in point. Now, it is clear that to throw *Heliochilus* into *Heliothis* is to contradict the diagnosis of the latter and to prevent our recognition of a peculiar structure. There is another species of *Heliochilus* apparently found in Asia. To refer both of these to *Heliothis* is to obscure the facts which all our classifications are intended to make plain. We must not lose sight of the fact that we are trying to fit plastic structures into unyielding categories, "to put nature into a straight jacket," as Dr. Packard calls it. Evidently we must increase our categories. The number of purely antigenic genera is small, but of those of a mixed character, in which features drawn from one sex alone (more often the male), are important in the diagnosis, the number is considerable. In *Arzama*, among the *Noctuidæ*, the female has a secondary sexual character in the large anal tuft. The ordinary genus, as I have considered it in the moths, takes in species agreeing in well-marked characters, allowing a certain range in minor respects of structure. But the moment we put together species with well-marked differences, we cover up the study of these differences. Here is where the tact and talent of the student come into play to decide upon the limits of ordinary genera. The question, under the rules here presented, is really simplified and the cases for a difference of "opinion" reduced to a minimum. A generic character must be decided upon with a knowl-

edge of the amount and kind of variation in structure in the group.

There is, finally, something real in family form, as elucidated by Agassiz, which Dr. Packard, in the moths, finds in head-characters and Dr. Herrich-Schaeffer in wing-characters. Lederer seems to find an average from all parts of the ringed butterfly or moth; his "families" differing more from the combination of characters they present. Exceptions to any one family character, such as disproportionate size in the whole insect or any of its parts, do not appear to me to invalidate the conception of a family. I do not wish to enter into argument as to the best classification of the *Tineidæ*, but, disagreeing with Mr. Chambers, I do not think any one would take *Anaphora* for anything but a Tineid. There are difficult genera on the confines of almost every family, but I think that after a complete knowledge of all the characters, and the neuriation is a very important one, we shall finally be able to agree upon the best position for any moth we have discovered yet, and this without establishing any family to rank with the *Pyrilidæ*, *Tortricidæ* or *Tineidæ* (excl. Alucitæ), as now considered. So far as we know we are not warranted in considering the *Tineidæ* as consisting of an assemblage of degraded forms, but a natural group affording sub-families not differing more widely on the whole from each other, than do the sub-families of *Pyrilidæ*, as arranged in my "New Check List." When we come to the study of descent we are without palæontological evidence, in fact, without *any* evidence which would justify our considering the long ciliæ as degradational. We have some evidence that a short tongue is a character of an old type and that the long maxillæ have come into existence with flowering plants. Thus, that the *Bombyces* are a group of sub-families, descended from a short-tongued early group of *Lepidoptera*, is a reasonable supposition. Aquatic habit, more or less correlated with structure, may be assumed as degradational, since it is exceptional in different families, and a water-life is lower than a land-life, as we see that it obtains in embryonic conditions and in low groups of annulose animals. In this connection Professor Comstock's discoveries of aquatic and predaceous larvæ in our moths are of immense importance. Great interest attaches to special enquiries of this kind, i. e., as to the value of a larger or smaller number of abdominal fleshy feet to the larvæ. So far as we can judge of degradational characters from biological data we have a solid basis for our deductions. The absence of testimony from fossils renders a certain class of speculations valueless. To return to the subject of classification, we cannot afford to dispense with neurational characters; hence, I should object to Mr. Smith's recent synopsis of the *Noctuidæ*, upon the ground that he distinctly passes over this important branch of the study. Although it is uniform, to a large extent, the neuriation of each genus should

be given, and of every species studied. The entire structure should be known when we enter upon a re-organization of the genera of described species. In conclusion, I must generally agree with Lord Walsingham's remarks on the *Tineidæ*. So far as I have studied them, we appear to be able to classify our moths under one or other of the families: *Sphingidæ*, *Ægeriadæ*, *Thyridæ*, *Zygenidæ* (incl. *Castnia*), *Bombycidæ*, *Noctuidæ* (incl. *Cymatophora*, *Brephos*), *Geometridæ*, *Pyralidæ*, *Tortricidæ*, *Tineidæ*, *Pterophoridæ* (incl. *Alucita*). The more "difficult" families are those in which the structure is divergent by reason of the placing in them genera of uncertain position, intermediary in character, or again isolated by an apparent "dropping out" of connecting forms. The *Sphingidæ*, *Ægeriadæ*, *Geometridæ*, *Tortricidæ*, and *Pterophoridæ* seem more easily recognized than the rest. They may be considered to be more distinctly specialized groups and, perhaps, of more recent origin. Among existing *Bombycidæ*, *Pyralidæ* and *Tineidæ* we may, I believe, look for some of the oldest structural types of moths. Assuming that the featherwing is a degradational character, as it is found in low forms in other sub-orders, we may consider the *Pterophoridæ* as having been thrown off from the *Tineidæ*, but not as an older type in time of the *Lepidoptera*.

NOTES ON ORGYIA BADIA, H. EDWARDS.

BY R. H. STRETCH.

Having found this species in abundance at Astoria, Oregon, on July 31 of this year, I give such notes on its transformations as were obtainable, in the hope that it may be the means of settling its specific standing.

On June 17 I found a mass of eggs which I judged to belong to this species. Many larva hatched during the succeeding week at intervals, but I could not induce them to eat, although I offered them rose and willow leaves, and the brood was lost. On my return to the same locality July 31 I collected the larvæ, cocoons, and one perfect male. Other males subsequently emerged (Aug. 6 and 8), but no females. Indeed the bulk of the cocoons found were apparently males (judging from their size) which in this genus is an excellent guide, the sex of the larva being also deferminable by both size and color. The males do not vary appreciably, and are so like those of *Orgyia Antiqua* of Europe that I am inclined to think with my friend H. Edwards that the two species are identical.

Egg.—Unlike our Californian *O. vetusta* and *O. gulosa*, the eggs are not deposited in a mass on the female cocoons, in a mixture of the down from the body of the parent, but are spread out on the surface of the cocoon in a thin sheet, side by side,

with no covering. The young larvæ consume about half the empty shell.

Larva.—Body black both above and below in some cases, in others there is a broad, dorsal, velvety-black line, the sides paler, with an indistinct darker lateral line between the first and second tubercles, sometimes followed below by a pale, broken line. Head black. Second segment very short, carrying two black fascicles directed forward, somewhat tufted at the tip, and a few, long, pale hairs between them at the base. Segments 3 and 4 are short, with four small, yellowish lateral tubercles on each side, with pale, short radiating hairs. Segments 5 to 8 similar, each with a compact yellowish, stiff dorsal tuft or brush, and three lateral tubercles on each side, with pale radiating hairs, that nearest the dorsum orange-colored and conspicuous, the others tawny and obscure. Segments 9 to 11 similar. The black dorsal stripe is narrowly edged with pale yellowish, each segment carrying a few pale marks in the black dorsal line. Four lateral tubercles on each side, the two uppermost orange and conspicuous, the others pale. All with pale hairs. Segment 12 similar to 11, but only two lateral tubercles on each side, the uppermost orange, and a stiff, vertically compressed, black fascicle, directed backward, of which the posterior hairs are the longest. Thirteenth, dusky with long, dusky hairs. Legs brownish. *Length*, 1.00 to 1.25 in.

The special characters are the black appearance of the larva, the pale marginal mottlings of the dorsal line on segments 9 to 12, the hairy orange tubercles, the want of brilliant dorsal fleshy tubercles, and the pale lateral line in pale colored examples. In the black examples, the orange tubercles and dorsal mottling on segments 9–12, are alone conspicuous.

Imago. ♂.—Comparison of 5 ♂ *Badia* with 2 ♂ *Antiqua* received from Dr. O. Staudinger, reveals such trifling differences that unless the larval differences are considerable, the two forms must be considered one, and as Mr. H. Edwards suggests *nova* of Fitch must probably share the same fate. My specimens of *Antiqua*, it is true, are somewhat smaller than the five *Badia*, and there is a browner tint on the latter than obtains on *Antiqua*, but so far the markings on the primaries above are identical in both forms, while the secondaries above and the entire insect beneath, as well as the body parts, show no appreciable difference.

San Francisco, August 10, 1882.

ON CERTAIN CATOCALÆ.

BY C. E. WORTHINGTON.

CATOCALA LUCILLA. n. s.

Primaries dull white, thickly overlaid with gray and bluish scales, but exhibiting the ground color in several conspicuous

patches, the largest beginning near the costa, immediately in front of reniform, extending to and including sub-reniform. Sub-marginal well defined and nearly continuous, bordered before with dull white and bluish-gray, t. p. line heavy, bluntly toothed, the inferior tooth small, sinus near inner margin black and heavy, t. a. line heavy, reniform outlined in black, sub-reniform pale, wide open, in about one example in four, and closed in others.

Secondaries red, median band constricted at one third of its length from costa, not reaching abdominal margin, but sometimes supplemented by a small spot. Beneath as in others of the group. Size, that of *C. unijuga* or a little larger.

This is the form alluded to by Mr. Grote in Can. Ent., Mch., 1882, as an unnamed variety of *unijuga*, which species it closely resembles, differing mainly in the somewhat larger average size, the clearer markings and the less continuous band of secondaries, and the toothing of t. p. line is different, the white spaces, reniform and transverse lines clearly defined and without the distinguishing squamosity of *unijuga* and, altogether, the species is a clearer and brighter form than the other.

I have taken this form in considerable numbers in this vicinity (Cook County, Illinois, and Lake County, Indiana) for a number of years and have gradually come to regard it as distinct from *unijuga*. Notwithstanding their close superficial resemblance from the fact that *Lucilla* occurs invariably a month later than *unijuga*, with a distinct interval in which neither form is taken, I describe it as a species, as its identity with *unijuga* can only be settled by breeding.

CATOCALA JUNCTURA. *Walk.*

This form (as determined by Mr. Butler) occurs here sparingly or a variety of *unijuga* simulating it closely. Examples are taken here not in any way to be distinguished from *Walshii* (*junctura*) from Kansas, with all manner of intergrades between that and *unijuga* and, occasionally, a well defined specimen of the latter, having the peculiar terminal hook on band of secondaries. It seems quite probable that a closer study of these forms will resolve *unijuga*, *Walshii*, *junctura* and, perhaps, *Lucilla* and other forms into climatic varieties of one species.

CATOCALA ILIA.

Variation *Conspicua*.—Primaries, brownish-gray; reniform, large, white; sub-reniform, obsolete, traces of pale brown and bluish-gray in interspaces, a dark patch adjoining reniform exteriorly.

Variation *Duplicata*.—Primaries, brownish-gray; reniform, large, white; sub-reniform, pale, connected with t. p. line. Some pale brown and bluish scales in interspaces, dark shade behind reniform.

Variation *Obsoleta*.—Primaries brownish-gray; reniform with pale brown centre surrounded by black line, and enclosed in white

spot; sub-reniform entirely obsolete; basal dash continued by a distinct dark shade to near apex. Sprinkling of pale brown and bluish-gray scales more conspicuous than in preceding.

Variation *Decorata*.—Color as in preceding; reniform like *obsoleta*, but less distinct; sub-reniform large, pale and wide open, or rarely closed; powdering of bluish-gray and pale brown scales in interspaces conspicuous; dark shade behind reniform heavy.

Variation *Umbrosa*.—Primaries uniform brownish-gray with hardly traces of other colors. Markings all present but more or less indistinct.

Variation *Confusa*.—Paler brownish-gray; reniform with pale brown centre in a darker brown ring outlined with bluish-white; sub-reniform, pale and connected merely with top line. All markings in brown, t. p. line being darker than the rest, the bluish-gray scales sparsely distributed over whole wing. Secondaries *orange-red*.

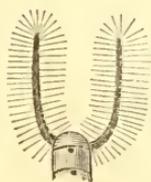
In a large number of examples of this very variable species I have found none that cannot be placed under one of the forms described, nor do the gradations between them seem finer than between *innubens* and *scintillans*.

No better illustration of the uncertainty of the position of the sub-reniform as a specific character can be found than in this species, where in one form a portion of the examples have this wide open, another portion closed, but connected with t. p. line, and still others with the spot entirely detached. In the species, as a whole, all gradations can be found, from no sub-reniform at all, to individuals with it large, pale and wide open.

The forms now described, by placing *obsoleta* at the head, and following with the others in the order named, form a very pretty series, and if *obsoleta*, *decorata*, *umbrosa* and *confusa* be selected, they would readily pass as distinct species; great variation is observable throughout in the indentation of the t. p. line, but not sufficiently to admit of further division, no ground for such division, either as a matter of convenience or otherwise being apparent, unless the position of the sub-reniform in *decorata* should justify dividing this one form into three. All of these variations appear to be strictly morphic, the species being single brooded, and there being no apparent limit of variations to localities.

ANAL APPENDAGES OF LEUCARCTIA ACRÆA.

BY R. H. STRETCH.



Not having, in my reading, seen any notice of certain very peculiar appendages to the abdomen of this common insect, it may be interesting to put on record some observations made a few evenings since. It may be that they are well known, but if not I will suggest that examination be made to see if the

Eastern examples differ in any way from our Californian ones in this respect.

While collecting round the suburban street lamps I thought I had found a moth with most peculiar antennæ, the moth being invisible at the time. A closer inspection showed the objects to be the anal appendages of a male *acræa*. To preserve them extended I attempted to kill it suddenly by crushing the thorax, but when I got it in my hand there was nothing visible but two tufts of black hair slowly disappearing under the penultimate (ventral) segment of the abdomen. By applying a gentle pressure from the base of the abdomen towards the tip I was fortunate enough to see them gradually protruded, presenting a most beautiful appearance, and by tying a thread tightly round the tip of the abdomen was able to retain them extended.

They each consist of a delicate membranous tube, gradually tapering to the tip, covered all over with the most delicate, evenly cut, silky black hairs, which stand erect when the organ is distended, presenting the appearance of a miniature copy of the small circular brushes used for cleaning lamp-chimneys. The hairs are nearly one-eighth of an inch long, and the total length of the organ fully half an inch.

They do not protrude in a direct line with the body, but project somewhat from the sides and then curve backwards parallel to each other about three-eighths of an inch apart, so that their shape is somewhat like a horseshoe, with the prongs directed backwards. The membranous tube is nearly white or pale yellow and when held against the light is apparently ringed somewhat like a tracheal tube.

They are evidently inflatable at will, but, apparently, are but seldom used. This is the first time they have come under my notice, although I have taken the insect abundantly for years, as all collectors must have done.

Since noticing them I have not taken a female, so that I cannot say whether they are confined to the male sex, but presume they are. They are present in the three males I have examined and, doubtless, may be classed under the head of sexual appendages. Will some Eastern collector look if anything like them occurs in the genus *Spilosoma*?

San Francisco, September 9, '82.

NOTES ON LEPIDOPTERA.

SAMIA COLUMBIA AND ITS PARASITE. In the May No. of "PAPILIO," 1882, appear some notes on the food plants of this species, in which its northern habitat is indicated. Since writing these notes I have received evidence of its occurrence in Manitoba, at a point 120 miles west of Winnipeg and 20 miles north of the C. P. R. and have now, in my possession a cocoon containing a living pupa collected at that point. No doubt the species is correctly named *Platysamia Columbia*—or perhaps more properly *Platysamia Cecropia* Var. *Columbia*. I have also found a parasite on this species which is believed

to be new to science, and have ventured to name it *Echthrus Provancheri* in honor of my esteemed correspondent and friend L'Abbe Provancher of Cap-rouge, P. Quebec. W. BRODIE, Toronto.

LOCALITIES OF DIURNALS. In the descriptions of some new species collected by me, ("PAPILIO" Vol. 1, pp. 43-48) Mr. W. H. Edwards has accidentally given a few erroneous localities, which as a matter of interest to Entomologists, I hasten to correct. *Anthocaris Morrisonii* is found on the barren mesa lands, particularly the summits of small hills, near Kern River, Calif; *Melitæa Perdiccas* on the small prairies numerous near Puget Sound, Washington Territory. It was abundant near Tenino. *Melitæa colon* was found on the sides of the hills which line the banks of the Columbia river, in W. Washington Territory and Oregon, being especially common near Kalama. *Copædes eunus* was taken in the bottoms of Kern River, near Bakersfield, Cal., and *Pamphila sirus* and *P. Mardon* on the prairies of Washington Territory, mentioned above. H. K. MORRISON.

CATOCALA CONCUMBENS ab. HILLII. This very singular aberration has been taken by Mr. W. W. Hill at Center, N. Y. The specimen is perfect and resembles in every particular the usual male type of the species except that the hind wings are of a very light pale yellow, deepening in color at the base. This aberration recalls *C. Illecta*; and, as I have before pointed out, there is no question that the species are related. The division into groups from the color of hind wings no doubt, occasionally separates related species in this genus. A. R. GROTE.

CALLIDRYAS FISHERI. n. sp. or var.

Primaries rich yellow, almost the same shade as the ground color of *C. Philea*, ♂, but with a slight buff tint, a little paler at the base and along the basal third of the costa. Discal spot, extreme apex of the wing, costal margin and seven marginal spots on the termination of the nervures, rich reddish-brown. In the small apical patch are some dark-brown scales. Fringes alternately brown and pale yellow. Secondaries wholly golden-yellow, a trifle deeper in color at the margins, with the discal spot of under side faintly visible. Beneath paler and less vivid than above, very sparingly flecked with reddish-brown spots. On the primaries is a faint sub-marginal band, straight as in *C. Agarithe* and the discal spot larger than on the upper side. The secondaries have a moderate ovate discal spot and a smaller round one above it brown, with the centre of each clear silvery-white. Head and antennæ reddish-brown. Thorax, above black, with long greenish-yellow hairs. Beneath, the thorax is lemon-yellow. Abdomen, above and below, golden-yellow, concolorous with the wings. Exp. wings 2.00 inch. 1 ♂, La Paz, Lower California. Mr. W. J. Fisher. Mr. A. G. Butler thinks this may be a var. of *C. Agarithe*. If so, it is a remarkable one and well deserving of a separate name. Its small size and absence of the ordinary spots are strong characters. HY. EDWARDS.

PAPILIO CRESFONTES. Cr.

I have captured a good many specimens of *Papilio cresfontes* the past season, mostly in the latter part of summer, but I saw a fine specimen flying near the middle of October. Several specimens have been taken by other persons, and the species appears to be common through this portion of the State. I found several larvæ, some quite small, being only about seven lines long; some also fully grown, which pupated about October 23. The larva appears to feed wholly in the day time. The change to the pupa occupied nearly four days in all. After tastening itself by its tail to the box cover, it remained suspended for over a day before fixing the loop around the shoulders, being over two days before the final change to the pupa, the last transformation occurring N. COLEMAN, Berlin, Conn.

ERRATA. Vol 3, No. 1, p. 11. The sentence, "a similar larvæ," to "margins of the leaves," belongs to *Habrosyne scripta*, and should follow the passage ending, "its early moults." P. 19; for *Entomophthora* read *Entomophthera*.

PAPILIO.

Organ of the New York Entomological Club.

Vol. III.]

March, 1883.

[No. 3.

COMMENTS ON DR. HAGEN'S PAPER IN NOV.-DEC.
No. OF PAPILIO, ON P. MACHAON, ETC.

BY W. H. EDWARDS.

My own views on the subjects treated of by Dr. Hagen are so different from his that I cannot let his paper pass without notice, the more especially as now that he has seen the way to the demolition of half a dozen unlucky species of *Papilio*, he is evidently warming to the attack in other quarters. This, as he tells us, is but "a portion of a Preliminary Report on the Butterflies of Washington Territory," and by the sample we judge the piece.

My learned friend, whose great attainments in biology and in general entomology we all recognize, is also a specialist, and his specialty is not the Lepidoptera. In Neuroptera or Hymenoptera he is high authority, in fact, in the former, the highest we have, but it is no disparagement to him to say, that in Lepidoptera, and especially in the North American Diurnals, he has not been known as an expert. That he should sit down, therefore, to a Report on Butterflies, and be able to give us fifteen printed pages on the first genus treated of, strikes me as something out of the common.

Now, it came to pass last summer that Dr. Hagen was offered the opportunity of accompanying the N. T. Survey, with the privilege of collecting what he could without hindering the purpose of the Survey; but was "expressly prohibited from advancing systematical or biological entomology." It was a great thing to be allowed to collect at all, but a most unfortunate one that not even a butterfly egg could be gotten unless it was picked off a bush, and that would amount to nothing, without violating the conditions of the appointment. Questions have been raised that could easily have been settled by breeding the butterflies from the eggs, laid by the females of the *Papilios* in confinement, but,

as it was, except two mature caterpillars of *Oregonia* discovered, nothing whatever was done towards the biology of any of the species treated of in the Doctor's paper. The entomological party seem to have been in the field ten to fifteen days, from June 24 to July 5, and were on the wing all the time, but brought home a large lot of butterflies of various species. The results of that excursion seem to have aroused in our friend an enthusiasm that will not be restrained, and it is clear he dreams of overthrowing the work of a score of lepidopterists who have gone before him, and of constructing on the ruins a sort of Ptolemaic system of arrangement of our species. I would not say a word, if this system were to be based on the preparatory stages of the several species, but that does not enter into it at all. What the system may probably be in its details is shadowed in a remark in a letter to me from the Doctor some time this winter, that after having worked a number of weeks on *Colias*, he "is getting the whole series into three or four species," * i. e., the North American *Colias*.

As there are something over a couple of dozen species of *Colias* claimed to belong to our fauna, of only two of which, outside of *Casonia* and *Eurydice*, are the preparatory stages at all known, this is evidently a weighty piece of work. All I wonder at is, that my good friend should stop at three or four, when it is just as easy to say one, and have all the species rank as varieties of that; as *Colias Primordia*, var. *Eurytheme*; var. *Philodice*. Really, I admire the zeal displayed and sympathise with the enthusiasm, but I must refuse utterly the conclusions reached by the Doctor. I have not much hope, however, that anything I shall say will alter his views. When a Professor of Biology, even with but a moderate acquaintance with butterflies, can deliberately declare that "it is probable that *P. Breviceauda*, *Bairdii*, *Indra*, *Pergamus* and probably *Americus*, belong all to *P. Asterias*," I fear he is past praying for. I write then not so much for him, but for a younger generation, who have grown up under more liberal teaching.

I hold that every permanent form possessed of marked characters which distinguish it from other forms, and which breeds true to its type, so far as appears, or we can know, is to be regarded as a species, at least, till the contrary is proved. And the proof must be actual, not imaginary, facts, not guess-work. That this is directly opposed to the view which can lump species into one,

* The lepidopterists of Europe are not agreed as to the position of divers of their own species of *Colias*, though 150 years have passed since Linnæus, during which time many generations of active workers have come and gone in every country. No one can say to-day what are the relations between *C. Patano* and *C. Pelidne*, or if there be any at all; and, for all that matter, no one will be able to speak with knowledge till both forms have been bred from the eggs laid by the respective females. All investigations which begin and end with the dried butterflies in cases of doubtful and obscure species amount to nothing. One may argue forever from the butterfly and be no whit nearer real knowledge of the facts. And now, what has not been done in Europe in five generations, our earnest friend thinks he can do with the American *Colias* "in course of a number of weeks" inside the walls of the Cambridge Museum. I recommend a tent in the field for a few seasons, and hard work, with much fatigue and many disappointments, but with patience to overcome all; then we shall begin to see results.

when nothing whatever is known of them, except what the dried butterflies show, and after the fashion set forth above with the *Asterias* group, goes without saying.

The attack is opened upon *Papilio Zolicaon*, so named and described by Dr. Boisduval, who was one of the foremost European lepidopterists of this century. Another species, *P. Oregonia*, was recently discovered by Mr. Henry Edwards, and described by myself. On p. 150 we read, "the large number of specimens of both sexes (74) approves the statement that both species *cannot be separated*." And establishing this proposition to his own satisfaction, the Doctor advances to "the knotty question of the American *P. Machaon*." That is, *Machaon*, var. *Aliaska*, Scudder. After running through the whole literature of *Machaon*, the peroration has the RING of victory. "Can the separation of the American species" (*Zolicaon*, *Oregonia*, etc.) "be maintained? I answer boldly, NO! After the examination of a hitherto unparalleled series of specimens, showing EVERYWHERE INTERMEDIATE FORMS, they should be considered as local or climatic varieties of one and the same species, of *P. Machaon*." And he closes, to the dismay of some of us, with the announcement that Mr. Pryer has now united eleven, perhaps twelve, species of *Terias* as belonging to one and the same species, which author concludes that "*neither size, shape nor color can be relied on as guides for specific distinction*;" and as he retires, comes this Parthian shot, "I believe that a revision of the North American butterflies *on this basis* is a want." At which I gasp, may heaven forbid that Mr. Pryer, or any of his disciples, should devote their destructive energies to the North American butterflies! I do not know Mr. Pryer, nor what sort of an observer he may be, nor what his facilities for the study of the *Terias* may have been, but this I do know, that unless he has arrived at his conclusion by breeding from the eggs, the assertion above quoted, if it really is intended to mean what the naked words declare, is not worth the paper it was written on. If eggs laid by one of the eleven or twelve species produced the rest, then the assertion might be made good, otherwise it is the sheerest guess-work.

Let us proceed to consider the statements of this paper. It is said, on p. 150, that seventy-four specimens of both sexes were taken in Washington Territory, east of the Cascade Mountains. "The typical *Zolicaon* is represented by half a dozen specimens flying promiscuously with the others." (If they fly at all in the same territory, they fly promiscuously, of course. In one group, by a puddle on the road, I often see *P. Turnus*, *Ajax*, *Troilus* and *Philenor*). "The main part of the specimens belong to *P. Oregonia*." What "true *Zolicaon*" is, the Doctor tells us under four heads. What "true *Oregonia*" is, we are left to infer, and in every case it is something not typical *Oregonia*. One or more characters are constantly modified in the direction of *Zoli-*

caon, or, at least, the Doctor thinks that is so. It does not appear from the text that a typical *Oregonia* was seen at all. I have no doubt several were taken, but nothing is said of it. We merely see a lot of nondescripts put down as "true *Oregonia*." We are, to be sure, told on p. 151, what the Doctor's ideas of *Oregonia* are; to wit, that it "is merely a variety of *Zolicaon*, mostly larger in size, more yellow, the black spot connected with the interior anal band, which is somewhat dilated on tip" (what is dilated? the band certainly is not), "the black bands of the abdomen narrower." That is no description of *Oregonia*, and I really have no evidence that the Doctor saw the species at all. What he so describes he says is merely a variety of *Zolicaon*.

These nondescripts, on p. 160, are called "intermediate forms," and the argument is that they connect *Zolicaon* and *Oregonia* in such a manner that the two so-called species cannot be separated, and *Oregonia* being assumed to be a derivation from *Machaon*, the other must be as well. There is a radical difference between "an intermediate form" and "an intergrade." The latter connects two varieties of a species, but a form may be intermediate and connect nothing. A jackal is intermediate between a dog and fox; a short-eared owl is intermediate between a long-eared owl and the great horned owl; and intermediate forms stand in every genus of butterflies. So that to say, that in this series of *Papilio*s are "everywhere intermediate forms," means nothing. The intention is, that everywhere are intergrades linking together the principal forms, so that the latter must be varieties, and not species. Were they species, the intermediate forms would be *hybrids*, not *intergrades*. Whether they be species or not remains to be seen. Besides the "American forms," the Doctor gets half a dozen hitherto supposed good species of the old world under the wing of *Machaon*. Of these last I have nothing to say, but I intend to show that the deductions are wholly at fault with the American species, and by inference they are probably so with the others.

I propose, then, to make it apparent:

I. That *Zolicaon* is a distinct species, having no affinity with *Machaon*, and that it never could have been derived from *Machaon*, or the reverse.

II. That *Oregonia*, while nearly all its affinities are with *Machaon*, and it belongs to the same group, yet is distinct from that species and is a species by itself; that neither could have been derived from the other.

III. That *Zolicaon* never could have been derived from *Oregonia*, or the reverse, the two belonging to distinct groups.

We must first discover what are the special characteristics of each of these species or forms.

I. What is *Zolicaon*?

1. It is distinguished by a complete ocellus at the anal angle



EXPLANATION OF PLATE I.

Illustrating the peculiarities of the anal ocellus in four species of *Papilio*, drawn by Mrs. Mary Peart. Figs. 1-3, 9-12 are drawn from nature. Figs. 4, 5 and 6-8 are copied from the plates in *But. N. A.*, vol. 2, for which they were drawn from nature by Mrs. Peart.

1. *Asterias*; fig 1, circular pupil.
 " 2, oval "
 " 3, pupil connecting with the marginal stripe.
2. *Zolicaon*; fig. 4, circular pupil.
 " 5, pear-shaped, etc.
3. *Oregonia*; " 6, striped ocellus.
 " 7, 8, club-marked ocellus.
4. *Machaon*; " 9 to 11, blind ocellus, with variations, the
 stripe extended three-quarters and
 more around the circle; 11, with bulb
 at end.
 " 12, showing the bulb severed.

of the hind wing. This ocellus is fulvous, round, with a narrow black stripe or rim on the side next the inner wing-margin, which stripe or rim ends at half-way down the fulvous ground on that side. In the centre, or sometimes a little out of centre, is a black pupil, usually round in the male, but sometimes oval, especially in the female, and sometimes, most often also in the female, and on the under side, pear-shaped (figs. 4, 5).

2. The cell of fore wings, on under side, is solid black, except for two yellow cross-bars, one on the inner side of the arc, the other a little distance towards the base.

3. The body is black, with a lateral yellow band along the abdomen.

This is the type, as designated by Dr. Boisduval. He expressly says: "It is easily distinguished from *Machaon* by its pupilled ocellus, and the body entirely black on under side." "Body black, with a lateral yellow band." He says it is near *Machaon*, especially the variety *Sphyrus*, but at first sight resembles, likewise, very much, *Sadalus* (P. *Americus*). His description is not at all minute, and he says nothing of the cell, evidently finding the two other chief characters sufficient to separate the species from *Machaon*.

II. What of *Machaon* in these points?

1. There is an ocellus placed as in *Zolicaon*, and like it, fulvous and round, but without pupil; and the stripe or rim on marginal side passes round the fulvous spot and ends at or beyond the middle of the side which is farthest from base (fig. 9, 10).

2. The cell is yellow, with two black cross-bars, one about at middle, the other half way between that and the arc.

3. The body is yellow, with dorsum black; on the lower part of abdomen are two and four black lines or narrow stripes. Dr. Boisduval, Spec. Gen., 1,329, says of this species: "Body yellow, with a dorsal black band."

Other comparisons might be instituted, but these three points are sufficient.

1. That the ocellus of *Machaon* is blind will be gainsaid by no one. The species is thoroughly well-known. It flies all over the old world, unless in middle and south Africa. If an example were found possessing a black pupilled ocellus like that seen in *Zolicaon*, it would be exceptional, extraordinary. I have before me, as I write, several examples of *Machaon* from Europe and Asia, obtained for me some years ago by Mr. W. F. Kirby, with a view of getting all the prominent varieties of the species. I have also fifteen examples from the frontier of Thibet, and one of same type, sent long ago by Dr. Hagen, from Himalaya, and labeled *Asiaticus*, Mén. I have fourteen of the American form, var. *Aliaska*. All these, European to American, agree in respect to the fulvous, unpupilled ocellus, except that two from Southern Europe have it yellow, as do nearly all the Alaskans. The

American and Himalayan also have no violet above the fulvous or yellow spot.

In all these *Machaon*, and it is characteristic of the species wherever it is found, there is a black line on the outer edge of the fulvous spot, running down the inner margin of the wing; curving around the spot, it usually ends at considerably more than half way along the farther side (from base) of same. If it were continued from 30° to 40° farther (figs. 11, 12), it would strike the black band of the hind margin and close up the circle. I have no example in which a quarter circle would not fill this gap. This line is often not at all thickened at the end (fig. 10); in some cases it is reduced there to a thread (fig. 9), the reduction taking place abruptly as the line leaves the margin. In some cases the line is thickened at the end into a bulb (fig. 11) of varying diameter. In the American examples there are all these variations, just as in the others. The thickening spoken of, being at the end of the line, is on the lower edge of the fulvous area, and occasionally the bulb is severed from the line, as in one of my examples (fig. 12), and yet forms part of the circle. I call particular attention to this point.

Now, the circular pupil of *Zolicaon*, placed in the middle of the fulvous spot, so as to make a complete ocellus (fig. 4), never originated in a thickened section of the rim. Therefore, this character never was derived from *Machaon*. The pupilled ocellus of *Zolicaon* is as significant as the ocellus in wing of *Satyrus Alope*, or the eye-spot of *Vanessa Io*. It is because it is small that the importance of such a feature is apt to be overlooked. If it covered as much ground as the eye spot of *Telea Polyphemus*, for example, it would at once be allowed to present a specific difference, when compared with another *Telea* having a blind ocellus like that of *Machaon*. Looking over my examples of *Zolicaon*, one female is seen to have an isolated black pupil on the upper side, but on the other, the same pupil is joined to the black rim on the outer edge. It is pear-shaped, and the prolongation of its small end strikes the rim, above its terminus, on the middle of the side at the inner wing-margin (fig. 5). The butterfly I speak of is figured in *But. N. A.*, vol. 2, plate of *Zolicaon*. Dr. Hagen says, p. 150, that among the *Zolicaon* examined by him, is one female from California, "with a continuation of the spot on the under side of the black stripe, which edges the inner margin. Mr. Edwards has figured, pl. 6, *Papilio*, f. 4, exactly the same for the female of *Zolicaon*, without mentioning it in the description." The Doctor refers in this way in order to show that one of the characters attributed to *Zolicaon* is variable in the direction of *Machaon*. If he can establish this point it will so far help to the assertion that *Zolicaon* is derived from *Machaon*. Undoubtedly the pupil in *Zolicaon* more or less often connects with the "black stripe which edges the inner margin," but that is

quite another matter from a thickening of the end of the same stripe such as is seen in *Machaon*. In fig. 5 the apex of the pear-shaped pupil hits the rim in the middle of the outer side of the ocellus and the *rim is prolonged beyond the connection*. I call attention to this last point also, for these little things have a meaning. In *Machaon* the end of the rim or stripe is thickened on the side farthest from base, and this end is 90° to 150° further round the circle than the end of same stripe in *Zolicaon*.

Now, how came that pupilled ocellus to be a main feature of *Zolicaon*, and a blind ocellus of *Machaon*? If *Zolicaon* is derived from *Machaon*, as Dr. Hagen declares, but cannot prove, how came in that persistent pupil, not found in the parent form? On the other hand, if *Machaon* is derived from *Zolicaon*, and, while guessing prevails, that guess is as good as the other, why do not examples of reversion occur? Why do we merely see a thickening of the end of the rim of the circle in *Machaon*, if there is any change at all from a mere line, and never a pupil?

Without question, every mark on a butterfly wing is variable, and among thousands of examples of a given species, all sorts of varieties might be expected, *but within certain limits*. Something cannot come from nothing, there must be a point or mark, a line to base a variation on. A line may break into spots, or spots may coalesce into a line or band, or bands, by suffusion, may spread all over the surface of the wing. But we never need hope to find in any sport an entirely new mark on a clear ground. There will be no ocellus on *Callidryas Eubule*. Now, I know of no evidence that a pupil was ever seen on the fulvous spot in *Machaon*. If such an example had occurred every collector would have regarded it as a singularity. It would have been treasured, for all collectors are eager to secure any oddity, and, probably, an account of it would have reached one of the entomological journals. In which case, Dr. Hagen, who knows all about the literature of entomology, would certainly have seized upon it and made it conspicuous in his paper. He has discovered two instances in *Machaon* of a cell more or less black; one in a figure by Freyer, "which has the basal part of cell black, except a small paler spot near the base," p. 155; and one in a dwarfed butterfly in the Cambridge Museum, from Switzeland, "which has the basal half of cell black. That he says nothing of variation which shows a pupilled ocellus is the best proof possible that no instance of it is recorded, at least. If, however, such an ocellus ever did appear in *Machaon*, it would fall under what Darwin calls the law of analogous variation, where "varieties of one species mock distinct but allied species," to be explained on the "principle of allied species having descended from one primitive form." That is, it would be a case of reversion.

I think it highly probable, from various reasons, especially from the peculiarities of the caterpillar in its several stages and

in its food plants, and also of the chrysalis, that a remote ancestor of *Machaon* did possess a pupilled ocellus. But if this was so, the pupil was lost so long ago, that, even by reversion, no one can now report an existing example. It is one of the chief points in all the descriptions, and all the figures of *Machaon*, that it has an ocellus without pupil.

2. The black cell in *Zolicaon*, the yellow cell in *Machaon*. I have never seen a *Zolicaon* from California, the metropolis of the species, which has a cell varying from the type. On the other hand, I have never seen a *Machaon* from Europe or Asia which had anything but a yellow cell. Of course, variations may sometimes take place in this character in these species; either the black may, by suffusion, run over the yellow, or yellow over the black. I think, by subjecting chrysalids to cold, I could bring about such varieties, as the colors run under such conditions in many cases. Dr. Hagen finds one instance of a *Machaon*, with cell black at base, another partly black, as before said; but such cases must be extremely rare. And a *Zolicaon* with a yellow cell would be a *rara avis*, as any collector knows.

3. The body of *Zolicaon* is black, with a lateral yellow band; of *Machaon*, yellow, with a dorsal black band.

I have received, during twenty years, a great many *Zolicaon* from California, and, as I carefully preserve for my own collection every variation from the type of any species, the collection to-day would show if there had been any noticeable variation in *Zolicaon* received by me. None such is present. I have applied to several correspondents for their experience. Mr. Henry Edwards, who resided a number of years in San Francisco, and collected butterflies indefatigably all over the State, writes me that *Zolicaon* is very common about San Francisco, that he has not in his collection now, nor does he remember to have seen, an example in or from California which did not possess the three characters I rely on. Mr. B. Neumoegen, who has one of the most extensive collections of American butterflies yet made, knows of no example off type from California. Mr. E. M. Aaron, of Philadelphia, has examined three collections in that city, at my request, one being his own, and one that of the Ent. Soc., of which he is the Curator, with the same results. So that *Zolicaon*, in its metropolis, is remarkably constant to type.*

It is because *Zolicaon* is not derived from *Machaon* that it presents the remarkable features we are treating of. Where then did they come from? Now, every member of the *Asterias* group which I have seen, and I have before me, as I write, all the species enumerated by Dr. Hagen, except *Pergamus*, (which is represented by an unique specimen in the collection of Mr. H.

* While this paper is passing through the press, I have a reply also from Mr. W. G. Wright, of San Bernardino, to whom I wrote on same subject. All his examples of *Zolicaon* are characterized by black bodies, black cells, and pupilled ocelli. He sends me seven of them, and they are all true to type.

Edwards, who described it, and this agrees with the others), has precisely that pupilled ocellus of *Zolicaon*. Not only that; as the pupil varies in *Zolicaon*, so do the pupils in all these species vary. They are larger or smaller, circular or oval, or sub-oval; exactly in the centre, or a little out of centre. And about one-third the examples of each species, where I have several, show exactly the connection between the pupil and the rim which Dr. Hagen calls attention to; and it is usually in the female, on the under side. On the plate of *Brevicauda*, in But. N. A., this peculiarity is shown on under side of male (f. 2). On the plate of *Bairdii* the same is shown in both sexes. The rim runs past the point of connection, which is on the middle of the side on inner wing margin. And just as *Zolicaon* agrees with the *Asterias* group in the pupilled ocellus, so does it in the black cell. That is a special characteristic all through that group. So all the *Asterias* group, unless it is *Americus* female, have the body black. *Indra* has it wholly so, except that in the ♂ there is a bit of yellow on side next last segment; the female has an indistinct stripe of same along the side, distinct at the end. *Asterias* and *Brevicauda* and *Bairdii* have two and three rows of yellow dots on either side of abdomen, which otherwise is black. So does *Americus* male show one of the same lines of spots, the sub-dorsal, while the lower are suppressed. There it is! To get the nearest ally of *Zolicaon*, in the matter of its three chief characteristics, we have to go to a group distinct from the *Machaon*, and there we find not merely the same characters, but in the most important of the three, the ocellus, exactly the same modification of it. Plainly enough, *Zolicaon* has a close connection with the *Asterias* group, and it is open to assert that the two are descended from a common type, which was characterized by a pupilled ocellus, a black cell, and probably, by a black body. I do not think that any one who believes in the derivation of existing species from antecedent ones will refuse to admit that. The ocellus in *Zolicaon* tells its story as clearly as do the bars on the wing of a pigeon. The different species of the *Asterias* group form one branch, and *Zolicaon*, with perhaps *Americus*, another branch, from the same stem; though it may well have been that at one or more steps farther back, this stem and the one from which the *Machaon* group descended found likewise a common ancestor. But *Zolicaon* has no present relations with the *Machaon* group, standing wholly apart from it.

That *Zolicaon* has come to differ from the *Asterias* group in respect to the yellow side-stripe is not more than might be expected if it branched off at all. This stripe would not originate by the introduction of a new character, but by the modification of one already there; to wit, the two lines of yellow dots, one at the verge of the dorsal area, the other on lower half of side. The side stripe of *Zolicaon* occupies the space corresponding to that limited

by these two lines in *Asterias*. We see a modification of the *Asterias* marks in *Indra*, where the yellow dots are suppressed, and in the male a dash of yellow is applied to the side at the last segment; in the female the dash is extended obscurely the length of the abdomen. If it be alleged that, although *Machaon* and *Zolicaon* differ in these three important points, yet they resemble each other in certain other points, just as important; viz, in the size and arrangement of the yellow spots on fore wings, and in the yellow base and disk of hind wings, in both which respects they differ from *Asterias*, I would say:

1. The marginal yellow spots of these several members of the *Asterias* group are very similar to those of *Zolicaon* on both wings and occupy the same positions.

2. The spots of the discal or interior band in the *Asterias* group occupy the same positions on the wings as do the discal spots of *Zolicaon* and *Machaon*. In these two species the spots spoken of are elongated, but *Bairdii* has them much more elongated than *Asterias*, and *Americus* still more. Indeed, this last is very close to *Zolicaon* in this respect. The spots are long, pear-shaped, instead of four-sided, but they cover nearly as much of the surface as do those of *Zolicaon*.* And what is especially interesting in some examples, is that the whole of the base and disk of hind wings in *Americus* is yellow just as in *Zolicaon*.† We have seen that Boisduval was struck with the resemblance between these two species. Yet, surely, *Americus* stands very near the other species of the *Asterias* group. It has the ocellus, the black cell, and the male has the upper row of yellow dots on body just as in *Asterias*. In the examples before me, the lower row is wanting, and over the side to base of abdomen is a thin coating of yellow, not wholly concealing the black ground. I have 1 ♂ 2 ♀ taken in Arizona and both females have the side yellow-banded. But the bodies are in so crushed and rubbed a condition that I cannot pronounce more definitely on the marks or color of abdomen than this, that the sides are certainly yellow. The male is in excellent condition, and possesses another resemblance to *Asterias* in the orange color of the marginal spots on hind wing below, and in orange on the yellow ground next the black marginal band, in all the interspaces. The spots of the discal band of under fore wings are also orange, as in *Brevicauda*. I have two ♂ from Panama, and Mr. Neumoegen has sent me 1 ♂ from Chiriqui, and the three agree with the Arizona ♂, except that they all have the base of hind wing black. So that we have in *Americus* a species which stands between the *Asterias* group and *Zolicaon*, and which is

* In the figure of *Sadulus*, by Lucas, Pl. 10, Rev. et Mag. Zool., 1852, apparently a male, these spots, except the two lower ones, are narrow, and lie isolated in the middle of the black interspaces. But in all the examples of this butterfly which I have been able to examine, all the spots of the series are large and pear-shaped, and in breadth extend from nervule to nervule. The female has them larger than the male.

† There is a variation in this respect, some examples having the hind wings crossed by a broad yellow band, the base being black; while the others have the yellow quite up to base.

variable in one important character, the extent of the yellow area of hind wing; some examples resembling therein some members of the *Asterias* group, *Indra* and *Bairdii*, while others resemble *Zolicaon*. But the sum of resemblances between *Americus* and *Zolicaon* is greater than between *Americus* and any other members of the group, and the two fall most naturally into a sub-group. And the remaining species belonging to our fauna naturally fall into other sub-groups; as, 1, *Brevicauda*; 2, *Asterias*; *Bairdii*; 3, *Indra*. I do not believe that any one of these sub-groups has been derived from another, although I have shown how the side stripe of *Zolicaon* might have originated, if there were derivation. I would have every sub-group of equal rank, as alike sprung from same ancestor.

II. We now come to *Oregonia*. This species has a close resemblance to certain Asiatic forms, which may or may not have sprung from *Machaon*, especially *Hippocrates*. The reverse is just as likely, and indeed, more likely, in my opinion, if there was derivation anywhere. The fore wings are largely produced and their hind margins are incurved. The tails are longer in proportion than typical *Machaon*. On the under side, the whole surface is yellow, just as in *Machaon*, the cell of fore wings just the same, the abdomen the same, yellow, with yellow stripes. The most striking distinction is found in the anal ocellus. As in all these species we have had in review, the ocellus is fulvous, but *the rim comes down and ends as in Zolicaon, not as in Machaon*, which has it continued farther by a quarter circle and more; and right at the end there is a bend at right angles, and a continuation of the line is thrown across the fulvous spot a little below the middle thereof. The figures 6, 7, 8 show the peculiar character of this line or mark, and all are copied from But. N. A., plate of *Oregonia*. In fig. 6, under side ♂, we see a tapering, slightly wavy stripe, ending in a point. This simplest form I assume to be the normal one. In fig. 7, under side ♀, there is a modification of the plain stripe, in a long narrow club, reaching quite across the fulvous spot. Fig. 8 represents the upper side of the same female, and the thickening is greater, and the mark, as in other cases, is very long and tapers gradually. Now, this is altogether another sort of mark from the black pupil of *Zolicaon*, whether the latter stands alone in the centre of the field, or whether it strikes the rim. It is the modification of a stripe across the ocellus. Dr. Hagen states, in his specifications of what he thinks is *Oregonia*, p. 151, that "the spot is connected," etc; so that it does not appear that it is ever severed, or ever takes a different shape from that indicated in the figures.* In that

* In the original description of *Oregonia*, I said, "anal spot small, yellow below, fulvous above, with a rounded black spot in the middle, and which is connected with the narrow black edge of the margin." I should have said; "with a stripe or a club-shaped spot connected, etc." For my abominable carelessness I stand myself on the stool of repentance and apologise humbly to all concerned; and I thank Dr. Hagen for leading me to study these species as I had not done before.

mark *Oregonia* is curiously near an occasional *Asterias*, as seen in fig. 3; also, perhaps, still nearer to *Bairdii*, as seen on the plate in But. N. A., fig. 4. That is the single approach which *Oregonia* makes to the *Asterias* type, and here is another hint of a remote common ancestor. *Oregonia* certainly never got that peculiar mark from *Machaon*. To show the two together is sufficient. No large number of the former species have yet been taken, but this mark is constant so far, and no case of reversion to a blind ocellus with a *Machaon* rim is reported. On the other hand, no evidence is forthcoming that the *Oregonia* style of ocellus ever has appeared in a *Machaon*, and on both sides there would be cases of reversion had there been derivation.

I do not at all understand why Dr. Hagen did not see fit to institute a careful comparison between the larvæ of *Zolicaon* and *Oregonia*, and both with *Machaon*. All the materials were at his hand, so far as relates to the final stages of the several caterpillars. He says the party took two mature larvæ of *Oregonia*, one of which Mr. Stretch carried to imago, "which proved to be *Oregonia*.*

Inasmuch as Mr. H. Edwards has this imago and says it is *Oregonia*, I accept the statement. The relation proceeds: "The caterpillar is very similar to that of *Machaon* in form, color and pattern. As I am very well acquainted with the latter, I directly remarked a difference," specifying a single difference in the cross band of second segment, and nothing more. Now, the facts are these: *Asterias*, *Brevicauda*, *Zolicaon* and *Machaon* have their mature larvæ similar in form and color. Therefore, these two features in the comparison may pass for nothing. As to pattern, it is another matter. Fortunately, I have the colored figure of one of these *Oregonia* caterpillars, by Mr. Stretch, who also made the figure of *Zolicaon* caterpillar given in But. N. A. And both the original drawings lie before me. I have a colored figure of the same stage of *Machaon* (of course, typical), executed for me expressly, by Dr. Weismann himself. And I say, that this *Oregonia* larva differs decidedly in the pattern of the markings from either of the other two. *Zolicaon* and *Oregonia* differ between themselves, but both are nearer to *Asterias* than to *Machaon*. I intend to figure the larva of *Oregonia*, in Part XII, But. N. A., Vol. 2, this spring, and on same plate I will put this larva of *Machaon*. Till then I must ask my readers to take my word that they exhibit striking and specific differences. †

* All through the paper the Doctor persists in calling this species *Oregonius*, "*Oregonius*, not *Oregonia*, as Mr. Edwards writes," p. 157. I shall file a caveat to protect the name I christened this species with. Why does the Doctor not talk about *Aliaskus*? When I give a species a name I expect it to travel under it henceforth.

† Dr. Hagen gives us much lore about the larva of *Machaon* from the books, to make good his proposition, that, as the imago shows a large variation in color, so the caterpillar and chrysalis "also differ considerably." But the only deviation from the green and typical mature caterpillar shown is a black form, which occasionally appears. That is, the black color of the larval stages which precede the last stage is projected into that; a kind of variation that might be expected. None of the cases cited at all concern *Oregonia* or *Zolicaon*.

III. That *Zolicaon* never could have been derived from *Oregonia* or the reverse follows from the position of the two species in two distinct groups. The latter species is unmistakably allied to the *Machaon* group, the former to the *Asterias* group. I have shown this, and the proposition needs no farther remark.

We now come to the "intermediate forms," which Dr. Hagen would have us understand are intergrades between *Oregonia* and *Zolicaon*. If I have established the position that *Zolicaon* belongs to the *Asterias* group, or at any rate, is nearest to that, and is removed from the *Machaon* group, and I think Lepidopterists will agree that I have, then, inasmuch as it is conceded on all hands that *Oregonia* is a member of the *Machaon* group, these forms cannot be intergrades, because the product of two species is not an intergrade. (I would say here that I have seen none of these famous examples, though more than once, and long ago. Dr. Hagen promised to send me them. I am not at all certain that if I were to see them, I should agree with the Doctor in regarding them as particularly connected with either of the species spoken of, but at present, I have to be governed by what he has told us).

Dr. Hagen tells us that he found all these nondescripts, (with yellow abdomen and black cell; black abdomen and yellow cell, etc.), in a certain district east of the Cascade Mountains, which he says possesses a very different climate from the district to the west of these mountains, "the latter being similar to that of California." He tells us that it is a sage-brush desert, with the least rain fall of any part of the United States, and the heat is excessive, "more than a week above 100°," "where nearly no rain falls through the summer, a sage-brush desert on basaltic soil."

The typical *Zolicaon*, as before said, is common throughout California. It also flies through Oregon, and, at least, into Washington Territory to the west of the Cascade Mountains. Dr. Hagen took half a dozen, true to type, east of these mountains also.

On the other hand, the typical *Oregonia*, with yellow cell, yellow body, and striped or clubbed ocellus, had alone been seen before this excursion into the sage-brush desert. Its habitat, so far as known, was in Western Oregon and Washington Territory. Mr. H. Edwards had also taken one example of *Machaon*, var. *Alaska*, at the Dalles, W. T.

Taking the relation of Dr. Hagen, just as he gives it, I see no alternative but to assert that he has had the good fortune to fall in with a lot of hybrids in this secluded and infernal sage-brush desert. There is no improbability in this. No one accuses *Colias Philodice* of being a variety of *Colias Eurytheme*, at least, no one has hitherto done so, for I am not at all certain that our friend herein concerned does not embrace both these in one of his three or four species; but I have several orange "Colias, which appear to

be hybrids, and in two instances undoubted males *Eurytheme*, one of them fiery-red, the other pale, or the *Keewaydin* form, and two yellow females *Philodice*, with which they were taken in copulation. As the red one was so taken by Mr. G. M. Dodge, who gave it to me, there can be no question of the fact of the capture. From what I know of the frenzied eagerness with which certain male butterflies (as I have related in the cases of *Papilio Ajax*, Can. Ent., 13, 209, and *Heliconia Charitonia*, *Papilio* 1, 213), watch the coming of the females from chrysalis, I am confident that they would seize upon the females of any allied species just as readily, if one of their own were not at hand. If such things occur in the mild climate of the Mississippi valley, where females of *Eurytheme* are as common as the males, what may not occur in a sage-brush desert, with no rain fall and the mercury above 100°? The panting male cannot fly over hill and valley, under these conditions, seeking its mate, as we often see male butterflies doing in a Christian country. Nature impels him, and he captures the first female he meets. That this is the fact in multitudes of cases in that arid district is highly probable, and it will account for all these curious nondescripts taken by Dr. Hagen.

My summing up is this: 1. *Zolicaon* is a species subject to little variation. It is a member of the *Asterias* group, forming with *Americus* a sub-group. The other species of the group are divisible into two or more sub-groups, and all these are of equal rank, sprung from a common ancestor.

2. *Oregonia* belongs to the *Machaon* group, and (perhaps with some other species) forms a sub-group of equal rank at least with the sub-group to which the species *Machaon* belongs. It certainly cannot have been derived from the species *Machaon*.

3. *Zolicaon* and *Oregonia* being distinct species, in distinct groups, the supposed "intermediate forms" discovered by Dr. Hagen, in a limited and exceptional district, are not intergrades, but, unless they constitute a distinct species by themselves, are of necessity hybrids, and probably between *Zolicaon* and *Oregonia* (and, perhaps, *Aliaska*).

And, finally, that the grand propositions enunciated by Dr. Hagen: 1. That *Oregonia* and *Zolicaon* cannot be separated: 2. That these forms should be considered as local or climatic varieties of one and the same species, *Machaon*, fall to the ground. *Req. in pace.*

In such cases as that of *Oregonia*, where a well-marked species is only found to exist in a much-restricted area, while its nearest allies flourish exceedingly and occupy a large territory, I hold that the former come of a high antiquity. Any form sprung from an existing one would never have attained specific rank unless specially favored, and it would flourish at the expense of the

parent form. It is because of its powerful vitality that it alone has survived, when all other varieties and any intermediate varieties have perished. Of the class indicated, are *Papilio Brevicauda*, confined to Nova Scotia, Newfoundland, Anticosti and the adjacent main land only, while *Asterias* flies all over North America, to the south and west of these regions, even to Panama; *Satyrus Pegala*, confined to the vicinity of the Gulf of Mexico, in our Southern States, while *Satyrus Alope* flies universally outside that district.

In my experience in breeding butterflies from the egg, and all the years since 1870, I have done it largely, while dimorphism or polymorphism have, in several cases, been established between forms where some sort of connection had been suspected, but of what nature no one could tell, and while what many had supposed to be mere varieties, have turned out to be distinct species, differing in their larval characters decidedly from the supposed parent, yet I do not recollect one instance where the reverse has taken place, and a form with marked characters, which I had assumed, on the strength of the imago only, to be a species, has turned out by breeding to be a mere variety. And yet, on the lumping-of-species theory, that ought constantly to have occurred. The fact is, I apprehend, that a marked difference in the imago carries with it a marked difference in the larva, at least in all species which have larval characters definite enough to seize upon. Even Dr. Hagen observed, and calls attention to, a difference between the larvæ of *Oregonia* and *Machaon*, and, as before stated, he might have found more if he had looked farther. The Doctor even has discovered, p. 160, that there are "differences in the finishing of the detail" of the genital apparatus of the males in the same two species. No doubt there are, and certainly there ought to be.

This paper is already so long that I can add but a few lines about the var. *Aliaska*, and its right by priority to give the name to the Himalayan form of *Machaon*, which has been called *Asiaticus*, Ménériés, but incorrectly, which right Dr. Hagen disputes. I am not a stickler for priority in names, as is known, and I have long held that a Resolution should be passed by entomologists in convention, by which twenty years undisputed use of a species name should give it a good title. Under this Rule, if it could be had, *Asiatica* (not *Asiaticus*, for the other is the name Ménériés gave the species), would certainly prevail, both for the Himalayan and the American form, unless where more is known of the latter, greater differences appear than we now discover. But, as M. Ménériés saw fit to restrict his name with the utmost precision to what is now seen to be a mere aberration, I cannot help it. The name *Aliaska*, Scudder, under the present Rule, applies equally to the Himalayan form. Ménériés says his var. differs from *Machaon* in the one character, a broad marginal border to hind wing, the

inner edge of which is straight (*droite*, in italics in his text). As he left it, we have to accept it.*

NECESSARY RESTITUTION OF THE NAMES GIVEN BY TH. W. HARRIS TO TWO NORTH AMERICAN SPHINGIDÆ.

BY DR. H. A. HAGEN.

The arrangement of the biological collection of the Lepidoptera obliged me to compare carefully the literature to ascertain which names I have to adopt. It seems to me that among the Sphingidæ two North American species, first described by Th. W. Harris, should retain his names. *Ceratomia quadricornis*, described 1839, has been changed to *C. anyntor*, Hubn. This species is figured by Huebner Samml. exot. Schm. Vol. III. (not Vol. II., as it is quoted by Messrs. Grote and Robinson, p. 16, which error is repeated by Mr. A. G. Butler, Sphingidæ, p. 621). The date of the plate containing "*Agrius Anyntor*, Pennsylvania," is not sure, but certainly later than, as quoted by Messrs. Grote and Robinson, 1806-1824, and by Mr. Butler, 1806. This plate is No. 46 (numbered by pencil) in the copy of Vol. III. of the Harvard Coll. Library of the fifty-three plates forming the whole volume here and in von Heyden's Library in Frankfort o. M., Europe. Geyer's Necrolog. of Huebner, in Thou's Archiv F. I, p. 30, states, July 1, 1827, that the Samml. exot. Schmetterl. contains 439 plates. These plates form Vol. I. and Vol. II., but the copy before me, and others compared in Europe, contain only 438. Geyer states further that he has decided to continue the publication of Huebner's works; but in 1827, the plate with *A. Anyntor* had not appeared. Further, on the original wrapper (in the library in Berlin) Sammlung Europ. Schmetterl., Horda, Vol. VII., 1834, Mr. Geyer states that for the Vol. III., Samml. exot. Schm. "are now ready thirty-one plates." As *A. Anyntor* is plate forty-six, it is published only after 1834, and in any way is not *Anyntor* of Huebner, but of Geyer. Perhaps it may even not antedate Harris.

It is a rule, everywhere accepted, that a figure even named can never antedate a description. Therefore, Mr. Harris, who knew that the copy in Harvard Library arrived here July 20, 1849, has, in a copy of the catalogue of N. A. Sph., presented to Prof.

* In my paper on the American form of *P. Machaon*, in this Magazine for May, 1882, I stated that the black parts in var. *Alaska* were more intensely colored, etc., than the old world types, but I made an exception in favor of the Himalayan, saying of these, they "resemble the American in this respect." Dr. Hagen says of my statement, p. 157, that it "is not true." "The large material before me proves this statement for the Himalayan specimens, and even for some European ones, to be incorrect." The Doctor misapprehended me.

L. Agassiz, and which contains a few notes in his hand, not changed the name of *C. quadricornis*. He has changed his *S. Carolina* to *quinquemaculata* and says of *G. epimenis*, that "it is probably a species of *Brepha*." Therefore, *C. quadricornis* has to be retained, as Huebner had nothing in any way to do with this species.

Of *Sphinx cinerea* Huebner, Vol. II., gives only a figure with the name *Lethia chersis*, not even the locality. Therefore, Harris' name has to be restored.

Of neither of these species is any description whatsoever given by Huebner. In his Verzeich., 1815, *L. chersis* is not mentioned, therefore, the plate must have been published after this year.*

THE CAPITALIZING OF SPECIFIC NAMES.

To the Editor of "PAPILIO:"

Can the editor of "PAPILIO" inform me upon what ground and for what purpose American lepidopterists have recently adopted the vicious habit of capitalizing the specific names of their insects? The tendency among entomologists, generally, has been in the other direction of using a lower case letter, even when the species is named after some individual or, in other respects, may be looked upon as a proper name. The prime object of nomenclature being to facilitate study and thought, this last fashion has everything in its favor. The capitalizing of specific names is almost as bad and fully as unnecessary and confusing as the use of the lower-case letters which has come into vogue among some catalogues. I am led to ask the question upon reading recent articles by Mr. A. R. Grote, in which generic and specific names are often used singly and in each case capitalized, so that none but those few who are entirely familiar with the terms can know whether genera or species are referred to, except by guessing or laborious reference. If there can be any sound defence of the custom I should like to know of it.

C. V. RILEY, Washington, D. C.

CONCERNING SO-CALLED TEMPERATURE FORMS OF BUTTERFLIES.

BY ARTHUR G. BUTLER, F. L. S., F. Z. S.

I have read with much interest a paper by Dr. Hagen, "On *Papilio machaon* L., and its North American representatives, etc." and, considered from a Darwinian point of view, it is undoubtedly

* Since writing this paper I have learned from a correspondent in Europe that in Senator von Heyden's copy of Huebner, received by him from Geyer himself, this plate is marked "published 1838 by Geyer. H. A. H."

valuable, as bringing into a small compass much relating to *P. machaon* and allies that has hitherto been widely scattered, it helps to prove what we evolutionists have long believed, that *P. machaon*, *hippocrates* and allies are all descended from a common stock; but it does not and cannot prove that *P. machaon*, under any condition of temperature, would ever produce *P. hippocrates* or *P. rutulus*.

Mr. Pryer, of Japan, for whom I entertain the greatest respect as an essentially *field* naturalist, certainly makes a statement about the size of March specimens of *P. hippocrates*, which is so astounding that I can only regard it as a slip of the pen; $2\frac{1}{2}$ inches in expanse would be very small indeed for European *P. machaon*, most examples of which exceed three inches. I have examined a great number of specimens of *P. hippocrates*, taken by collectors who have lived in Japan for years, and the difference of size has only varied from $4\frac{1}{4}$ inches in the males to five inches in the largest females. I do not mean to say that you could not starve them into smaller insects, but, as a lepidopterist, who has seen probably more Japanese Lepidoptera than any man not living in Japan, I must be excused if I believe that Mr. Pryer has forgotten to double his measurement or has, at least, written a 2 for a 3 in the note upon this species.

If, however, we were unquestioningly to accept the statement that some examples of *P. hippocrates* were smaller than the European species, it would not alter the fact that the former, with its more-produced primaries, the broader dark belt of secondaries, the inner edge of which is scarcely undulated (unlike the European insect) and its usually melanistic female is confined to Japan, and *P. machaon* to Europe, and has no more claim to be called the same species than the *Gonepteryx aspasia* of Ménétriés, with its acute falcate primaries, has to be regarded as identical with the broad-winged *G. nipalensis* (a specimen of which we have from Nikko, which Pryer confounds with it.*

Does Dr. Hagen expect us to associate as conspecific all forms descended from a common ancestor? If so, all naturally constituted genera may be called species, and all species representative forms; but *cui bono?* the species will exist, by whatever terms we know them. I will not say "a rose by any other name, etc," because Dr. Walsh argued forcibly against the truth of that statement, but I will say this, that nothing will be gained by the change.

Now, as touching the species of *Terias*, associated by Pryer, and for which, as he considers that too many names have already been proposed, he suggests another, with a view to cure the evil on the homœopathic plan. It may, perhaps, surprise Dr. Hagen to

* I did, indeed, once receive a specimen of typical *G. rhamni* from Yokohama, I believe Mr. Pryer sent it in a collection which I received from Mr. Fenton; I recognized it at a glance as British and this was admitted by Fenton and (if I mistake not) by Pryer also.

hear that, of the eleven in that list, only five occur in Japan; and, therefore, that six are admitted on the authority of other entomologists, who had made no special study of the genus; of these, *T. hecabe* is a Chinese species, ranging to India and Australia. It is always of a deep chrome-yellow color in the males, the under surface is frequently immaculate and never more heavily marked than its near ally *T. mariesii*. *T. mandarina* occurs both in China and Japan, and in the latter evidently crosses with *T. anemone*, as that form does with *T. mariesii*, and here arises a distinct question. Are we to reject the specific distinction of well-marked forms, because when brought together, they will interbreed? There can be little doubt but that species, originally locally distinct, but the ranges of which have gradually been extended, are sometimes fertile inter se, and also, that hybridization between such species or "representative forms," carried on for many generations, produces a tendency to throw out gradations of form between the original parents, even in the progeny from a single batch of eggs. This is certainly the case with the silk-moths of India and Japan, which, according to the statements made by collectors, borne out by the collections sent home, are true to locality, until brought together for sale in the market, and thus subjected to the probability of hybridization.

But to return to Pryer's list, *T. sinensis* is probably *T. rahel* of Fabricius and belongs to a totally different section of the genus from *T. hecabe*. Mr. Elwes can never have read Lucas' description, or I cannot believe that even he, (notwithstanding his very broad views respecting the variation of some species) would have suggested the union of two forms so utterly dissimilar in all that constitutes a specific difference.

T. mariesii is, as I have said, the Japanese representative of *T. hecabe*, but not, therefore the same species. *T. anemone* is a form, perhaps, a species occurring rarely in China, and commonly in Japan. *T. connexiva* and *hybrida* are admitted hybrid varieties. *T. asiopce* is a N. E. Himalayan species or, perhaps, a race of *T. hecabe*, about equally distinct to *T. mariesii*. *T. hecaboides*, on the other hand, is a N. E. Himalayan species, readily distinguishable, both from *T. hecabe* and the whole Japanese crew, by having a brown transverse patch on the under surface of primaries towards the apex. *T. brenda* is a very distinct and purely African species, having a white female. It is entirely unlike any form ever existing in Japan, and, lastly, *T. sari* belongs to a distinct sub-section of the genus in which the under surface of the primaries is marked with a large, square, apical brown patch. Hitherto it has only come from Java, Malacca and Borneo. Its female is characterized by the obliquely cut situation of the external border of primaries. *T. sari* is, in fact, nearly allied to *T. silhetana*, but is not nearly related to *T. hecabe*. In conclusion, I have no hesitancy in saying that if Mr. Pryer could see the

species of *Terias* associated in his list under the name of *T. multiformis*,* figured together on one plate, he would laugh at his own credulity.

NOTES ON LEPIDOPTERA.

RARE SPHINGIDÆ. I have taken the following rare species at this place. *Arctonotus lucidus* at light, January 7 and 28, *Pterogon Clarkiæ* on flowers of wild turnip, March-April, *Sphinx Sequoiæ*, hovering over various flowers, April, *Sp. perelegans*, about various flowers, June. J. J. RIVERS, Berkeley, Cal.

WILLOW A FOOD PLANT OF PAPILIO RUTULUS. On August 29, 1879, I received from Mr. O. T. Baron, in Northern California, an egg of *Rutulus* in alcohol, which egg Mr. Baron informed me he saw the female deposit on willow; a remarkable food plant for a *Papilio* of this group. W. H. EDWARDS, Coalburgh.

DAREMMA HAGENI. In my paper in December "PAPILIO" I incorrectly gave Kansas (Snow) as a locality for *Daremma Hageni*, Gr. The material I examined came from Texas (Boll), the original habitat of the species, which has not occurred in Kansas yet. I must have misunderstood the statement made to me when I saw the specimens upon which I based my statement. The species seems to be only known from Texas, but is probably found elsewhere in the Southwest. A. R. GROTE.

BIOLOGICAL COLLECTION IN CAMBRIDGE MUSEUM. Perhaps it may be not out of place to make a general statement concerning the biological collection of the Lepidoptera in the Museum. When first arranged, about ten years ago, the number of species, more or less fully represented, exceeded 1200. The very numerous additions since this time made a new arrangement unavoidable. The Diurna now completed show 200 species. The Sphingidæ, now in way of arrangement, are surprisingly rich, and the Bombycidæ, Noctuidæ and Geometridæ even much more so, so that, probably, the final number will exceed considerably 3000 species. For the Micros the additions have been only small. Of course, anything that collectors may have to spare in the way of transformations will be thankfully accepted, in exchange or otherwise, as it is my intention to make this part of the collection as rich as possible for the benefit of students. H. A. HAGEN, Cambridge.

LOCALITIES OF BUTTERFLIES. In the Nov.-Dec., 1882, number of PAPILIO appeared descriptions of *Thanaos Tatus* and *T. Clitus*, with no mention of locality. The paper was sent on to be incorporated with the one which appeared in the October number on the new species taken by Mr. Morrison at Fort Grant and Graham Mountains, Arizona, but arrived too late. Hence the omission of the locality. Both these *Thanaos* were taken on Mt. Graham.

W. H. EDWARDS.

* Which name, having no type, can be quietly ignored.

PAPILIO.

Organ of the New York Entomological Club.

Vol. III.]

April, 1883.

[No. 4.

LIST OF APATELÆ BELONGING TO THE GROUPS ACRONICTA AND TRIÆNA.

BY A. R. GROTE.

Genus APATELA, Hubn.

Sub-genus *Triæna*, Hubn.

The type is the European *Psi*, with which our *Occidentalis*, etc., seem strictly congenerical.

1. OCCIDENTALIS, G. and R., Proc. Ent. Soc., Phil., 6, 16. The larva is described by Mr. Saunders and Dr. Packard, PAPILIO, 2, 181. "Western Dagger." Represents the European *Psi*, which is, perhaps, dimorphic in the larval state. Thaxter (PAPILIO, 3, 17) gives "elm." I have a figure of the larva on "apple," which agrees with Dr. Packard's description.

2. MORULA, G. and R., Tr. Am. Ent. Soc., 2, 196, pl. 3, fig. 75; Lintn. Ent. Con., 3, 137 (larva on "apple"). Disk of thorax ochrey. This is much larger and ochrey-tinged and paler, faded, compared with *Occidentalis*. "Ochre Dagger," Thaxter gives the larva also on "elm."

3. LOBELLE, Guen., Noc. 1, 44; Coquillet, PAPILIO 1, 6 (larva). On "burr-oak;" M. Guene describes it as "Lobelia" from Abbot's drawing. The largest of the group. Texan specimens stained with ochrey. "Large Dagger."

4. HASTA, Guen., Noct. 1, 45. Smaller than *Lobelia*; dark; fore wings blue-gray, hind wings dark. "Smoky dagger." Larva unknown.

5. FURCIFERA, Guen., Noct. 1, 44. Size of *Hasta*, hind wings pale, fore wings washed with white. "Forked dagger." Larva, according to Thaxter, on wild cherry.

My identification of these two species is taken from the Species Generale. I have seen no types. *Telum* and *Spinigera* are unknown to me, but must resemble these. Some one has labelled specimens of *Xyliniiformis* and *Pallidicoma* (both of which

I would refer to *Mastiphanes*) as "*Spinigera*," in different collections. *Interrupta*, Bdv., is founded on a drawing by Abbot. It is described as smaller than *Psi*; the moth may be *Grisea-Pudorata*; the caterpillar is flesh color, with red tubercles, surmounted with tufts or whorls of hair.

6. THORACICA, Grote, N. Am., Ent., I, 94. Colorado. The disc of thorax is discolorous; the insect is nearest, perhaps, to *Furcifera*. Larva unknown.

7. TRITONA, Hubn., Zutr., 107-5; Guen., I, 42. This is small, with dark blue-gray primaries and brown hind wings. Larva unknown. "Brown dagger."

8. GRISEA, Walk., C. B. M., 56, *Pudorata* Morr. Ann, N. Y. Lyc., 83, 1875. Like *Tritona* in size and form, but pale gray with whitish secondaries. Larva unknown. "Pale dagger."

9. FALCULA, Grote, Can. Ent., 9, 8, 6; Coquillet, Papilio 1, 6. This differs from *Tritona* by the bright brown edging of the thoracic tuft behind; the external margin is a little drawn in below apices; the dash at internal angle does not cross or indent the transverse posterior line, in which it resembles *Parallela*. Larva on hazel. "Edged dagger."

10. PARALLELA, Grote, Can. Ent., 9, 5, 3, Colorado, Texas, small, with pearly-white secondaries. A very pretty and distinct species. Larva unknown.

11. ALBARUFA, Grote, Proc. Bot., S. N. H., 239, 1874; *Walkerii*, Andrews Can. Ent., 9, 98. Larva unknown. The hind wings of male are white; of female fuscous. This species is known by the red and pale discal stigmata. "Red and White Dagger."

12. PAUPERCULA, Grote, Proc. Ac. N. S. Phil., 197, 1874, Texas. Larva unknown. Fresh specimens are olivaceous in tint.

13. VINNULA, Grote, Proc. Ent. Soc., Phil., 2, 436, pl. 9, fig. 2, Canada to Middle States, "Olive Dagger." I am rather doubtful of this little species really belonging to *Triana* (*Sama-phona* Guen.). It is distinctly olivaceous in color; it does not show the usual marks. Mr. Thaxter reports the larva on elm. I have seen no description of it. These are all I would now refer to this section of *Apatela*.

Sub-genus *Acronicta*, Ochs.

1. LEPUSCULINA, Guen. Noct. 1, 46; *Populi*, Riley, 2nd Mo. Rep. 119. Larva on poplar. Larger and stouter than the European *Leporina*, but belonging to this group with *Leporina* and *Vulpina*. Its range extends beyond the Mississippi and, perhaps, across the Continent. "Poplar Dagger."

2. FELINA, Grote, Bull. U. S. Geol. Surv., 5, 208. California. Larva (Pacific Coast Lep., 88) described by Mr. Hy. Edwards on poplars. Replaces on the West Coast our Eastern *Lepusculina*; the imagines differ but slightly, as far as observed.

3. VULPINA, Grote, Can. Ent., Jan., 1883; Thaxter, PAPILO

Jan., 1883, p. 14, described larva on birch and poplar. This is the true "representative" of *Leporina*, quite distinct from either of the above in all stages. "Birch Dagger."

4. TOTA, Gr., N. Am. Ent., 1, 10, Texas. This may not belong here, and these are all the N. Am. typical *Acronictæ* known to me. The range of *Felina* (No. 2) may include Colorado. Not enough material has been examined of this Western species.

I am disinclined to place *Insita* with *Acronicta*. This form should rather follow *Americana* and *Dactylina* under *Megacronycta*. The final arrangement of our *Apatelæ* must be arrived at after all the stages are known. Mr. Butler's paper on the genus was striking, but I am not prepared to follow conclusions based on one form of the species alone. *Apatela* is a group or genus in which the larvæ have submitted to independent variation; the gray color of the perfect insect and its streaked pattern of marking has been found useful and is preserved; this is apparent from a study of the larvæ of *Psi*, *Tridens* and *Occidentalis*. Dimorphism in the larva is a break in the direction of a distinct cycle of reproduction. In the two European species the break is considered to have proceeded far enough to warrant a title; but is this really so? I have not in literature seen that *Psi* and *Tridens* have been studied sufficiently. It must be proved that there is a want of connection between the two sets of larvæ. Like *Basilarchia* in the butterflies, we have in *Apatela* a rich ground for collecting facts bearing upon the natural rise of "species." I must highly commend Mr. Thaxter's recent descriptions of *Apatela* larvæ. When these are all known we shall know where to arrange such forms as *Innotata*, *Connecta*, *Radcliffei*, and under what "sections." I have carefully indicated the types of these "sections" from the names now in use in literature according to priority. Those established by me have the types all indicated. At present I am strongly inclined to believe that *Eulonche* (*Oblinita*, *Lanceolaria*) has more than a sectional or sub genera value. I have worked very thoroughly on the generic synonymy, and the student should study my Catalogue of the Noctuidæ in the Bull. Buffalo S. N. S. for 1874, where the typical species of each genus is given. I have, without assistance, performed a good deal of labor with nearly 1600 species of the N. Am. Noctuidæ. From what I expect, based on what I have seen, we shall finally have to arrange about 2000 kinds of Noctuidæ. In doing this, the preliminary work I have accomplished is useful from the care I have taken to use the right generic name, and I think uniformity may be properly secured by adopting my new Check List as the basis in this respect (for instance, in using *Apatela*, *Glaca*, *Lithophane*), since I have yielded every debatable point as against the undiagnosed genera erected by Hubner. There seems to me solid grounds for those I retain, and, at any rate, my reasons are all given for what I have done. I am not able to proceed in the publication of my general Mono-

graph of the *Noctuidæ* for want of proper assistance and a salaried position where I can continue its preparation.

The conclusions, with regard to classification, to which I have arrived are, first, that all forms separable on color or modification of a pattern of marking are, in fact, related. Whether the intermediate forms have dropped out, or are yet produced by any of the principal forms, is a matter which experience must show and which decides as to whether we call them "species" or not. While, in descriptive work, occasional errors are inseparable from the conditions under which it is performed, the synonyms from this cause are in reality not many in the moths, so far as I have found. Secondly, that generic characters must be, in principle, dealt with in the same way as specific ones, the limits of the genera depending on the want of intermediate forms, the important point being that the combination of characters which constitute the genus, shall be readily seizable by the student.

ON SOME NEW SPECIES OF ARCTIA, AND SUNDRY VARIATIONS.

BY B. NEUMOEGEN.

ARCTIA EXCELSA, n. sp.

Head whitish-yellow; orbits of eyes black. Antennæ black, moderate and bi-serrate. Thorax whitish-yellow, with two prothoracic black dots, and three large thoracic black stripes. Palpi blackish, hairy, bright-red above, with a broad black dorsal line and two black lateral lines, segmentarily serrated; beneath black, with yellowish lateral, segmentary maculations.

Primaries black, inner margin partly narrowly edged with a whitish-yellow line. Fringes yellowish; markings cream yellow, as follows: A broad horizontal line between median and submedian nervures, starting from base and ending some distance from exterior margin, crossing about three-quarters of the wing in a straight line. Two transverse bands, divergent on the costa, but nearing each other, nearly uniting and resting on the horizontal line. Attached to the middle of anterior transverse band, and covering space between the latter and exterior margin, an irregular, triangular blotch, the broadest part of which is facing the exterior margin. Secondaries black, with yellowish fringes intermixed with black. A large, bright-red discal spot of irregular shape. Beneath the markings are the same, only that the color is not so intensely black as above. Expanse of wings, 36 mill. Length of body, 11 mill. This is a most beautiful insect, following closely *A. Celia*, Saund., and being intermediate between the latter and *A. Snowi*, Gr.

Habitat, North Carolina. Types coll. B. Neumoegen.

ARCTIA INCORRUPTA, *Hy. Edw.*, ♀.

The ♀ differs greatly in its aspect from the ♂. The black color is more intense in the primaries and in the dorsal and segmentary stripes of abdomen. The transverse and horizontal bars on primaries are generally narrower and of a brighter yellow. The secondaries are of a deep red, fading somewhat towards base. The black marginal triangular-shaped blotches on secondaries are prominent and well-marked.

On a superficial glance this insect could be taken for *A. phyllira*, Dru. ♀, especially of the Southern types from Florida, but on closer examination bears out all the characteristics of *A. incorrupta*, ♂.

Types coll. B. Neumoegen.

ARCTIA INCORRUPTA, var. OCHRACEA. *Neum.*

A splendid variety of this handsome insect. Abdomen light yellow with black dorsal and lateral segmentary stripes. The markings on primaries of straw yellow; the secondaries of prominent bright ochre color. Otherwise agreeing with the typical form.

Prescott, Arizona. Type coll. B. Neumoegen.

TELEA POLYPHEMUS, var. OCULEA. *Neum.*

Primaries and secondaries are of a very light tan color. The ocellus on primaries is surrounded by a crescent of blue on inner side, and encircled by a prominent black ring. The ocellus on secondaries has a larger cloud of blue than in the typical form, being enclosed by a very broad, black, cloudy ring, which gradually shapes off into a black, broad transverse band towards inner margin.

This is a very handsome variety, occurring in New Mexico and Arizona, is larger than the Eastern types, and can be easily distinguished by the blue ringed ocellus on primaries.

Types coll. Prof. Snow and B. Neumoegen.

DESCRIPTIONS OF NEW SPECIES OF HESPERIANS FOUND IN THE UNITED STATES.

BY W. H. EDWARDS.

PAMPHILA BRETTOIDES.

♂. Size of *Brettus*.

Upper side of primaries bright yellow fulvous; discal mark on stigma, as in *Brettus*, flat, dull-black, pointed at outer end, bent a little in middle, broad in middle, and nearly even width to basal end, where it narrows and ends roundly; behind it a broad patch of black, and before it, black scales, most dense at the two ends; there is no fuscous patch between stigma and apex of wing; the hind margin also very narrowly edged with fuscous, without enlarge-

ment at apex (whereas in *Brettus* there is a large area of fuscous at apex and the margin is broadly-bordered with same color, with projections into the interspaces); on the inner edge of the apical area are two small fuscous marks in the sub-costal interspaces.

Secondaries yellow-fulvous on middle of disk, the costal margin fuscous, hind margin narrowly edged, fuscous. the inner margin obscured up to second branch of median; fringes yellow-fulvous.

Under side bright yellow-ochre; primaries have the base and inner margin black nearly to inner angle, immaculate, except that the two sub-apical spots appear faintly. Secondaries have a row of small pale fuscous patches beyond disk, two of which lie in lower sub-costal and upper discoidal interspaces, and two in the two median interspaces; these patches are much covered by fulvous scales; on middle of disk three small, similar patches, in which the black is more decided, the lower one (and largest) being at origin of lower median interspace, one at upper corner of cell, another above this.

Body above dull fulvous, below yellow, with a gray tint; legs color of wings; palpi whitish-yellow; antennæ fuscous above, pale fulvous below; club ferruginous above, tip same.

From 1 ♂ sent me by the late Jacob Doll, taken in West Texas, and 1 ♂ in collection of Mr. Neumoegen, taken by Mr. Morrison at Graham Mountains, Arizona.

AMBLYS CIRTES CASSUS.

Male. Expands one inch.

Upper side of primaries brown, dusted with fulvous, most densely on inner margin to cell, giving that part of the wing a fulvous hue rather than brown; from costa, at about four-fifths the distance from base, are three small light fulvous spots in straight line, and across disk an oblique row of fulvous spots, the upper one a little nearer hind margin than the lower of the costal spots and very near it; these spots are small at outer end of the row, but on the median interspaces are diffused; near end of cell a fulvous crossbar, which connects with a stripe of same color, running towards base next stigma; stigma short, confined to the second median interspace, narrow, a little bent down at outer end. Secondaries have the costal margins fuscous, the rest dull fulvous, with no spots; fringes dull white, or yellow-white, fuscous at the ends of the nervules, and along upper half of primaries; just at apex purer white.

Under side of primaries fulvous next base and over disk to costa, black on inner margin to base; the apex gray-brown, caused by whitish scales on brown ground; the spots repeated, those on costal margin white. Secondaries dark brown, dusted with whitish scales, along inner margin up to submedian nervure dull fulvous; a straight row of not well defined whitish spots beyond the disk, and at right angles to this two small similar spots at outer angle and on costal margin, this last in line with one or two

indistinct whitish spots on middle of the wing; another spot nearer base just over cell; all these spots are obscure, as they are of the same hue as the dusting of the wing.

Female—Expands $1\frac{1}{2}$ inches.

Upper side rather less bright, the spots yellow-white; beneath, the fulvous on anterior part of primaries is dull, and does not reach costal margin, which is dark, or blackish-brown, dusted with gray; the whole of inner margin to cell and to hind margin is blackish-brown; apex same, lightly dusted with gray; the spots white next costa, the rest yellowish and well defined. Secondaries as in the male, but the ground is blacker, and the whitish patches more distinct, forming a row bent at right-angles at outer angle of the wing; the inner patches form a similar bent line.

From 3 ♂ and 1 ♀ in my collection and that of Mr. Neumoe-gen, all taken at Mt. Graham, Arizona. The species is allied to *Nanno* and *Aenus*.

NOTES ON NEW SPECIES IN MR. NEUMOEGEN'S ✓ COLLECTION.

A. R. GROTE.

NONAGRIA PERMAGNA. n. s.

♀. A very large form, the largest known to me, and with the proportions of a small *Sphinx*, the resemblance heightened by the long abdomen, with the curious genitalia exposed beneath. Differs from all Guenee's descriptions in this genus and darker in tint than my *Oblonga*. The entire insect is of an obscure reddish-ochrey, concolorous. The markings are extremely few. On fore wings merely four to five black points of the transverse posterior line are visible towards the centre of the wing, and there is a terminal series of minute black points. There is a very sparse sprinkling of dark scales on terminal field, costal region and along sub-median interspace, only visible under a lens. Hind wings a little more reddish centrally. Beneath small discal spots and a common extra mesial shade-band, broadest on fore wings, which are clouded sub-terminally with fuscous. Indian River, Florida. *Expanse* 98 mil. *Length of body* 34 mil.

YPSIA ÆRUGINOSA. Guen.

I regard this as simply a fresh *Undularis*, just as *Carissima* is a pseudo variety, all fresh *Cara*, having a powdering of green scales, as indeed, has Guenée's type, and all *Hemaris Fumosa* of Strecher are fresh *Hemaris Tenuis* of Grote, with the fine scales adherent on the glassy fields which are to fall with the first quiver of the wings.

TÆNIOCAMPA PERFORATA, n. s.

♂ ♀. Of a peculiar greyish-fuscous or stone color, and allied to the Californian *Rufula*. The sub-terminal line is accented by

three or four preceding black points opposite the cell; the median space darker than rest of wing, the median lines and stigmata illegible; the reniform stained and blackish; claviform outlined. Lines marked by double costal streaks, with paler enclosed shades. T. p. followed by minute points; fringe a little darker. This may be a color variety of the Californian species, as I have seen some Californian specimens varying in this direction, but I prefer to register it as distinct for the present, not being willing that what may be different species should be labeled *Rufula Perforata* is concolorous, grey-fuscous, smooth. Hind wings pale at base, with pale fringes and soiled veins. Beneath paler grey, irrorate, with dark denticulate common line; suffused discal shade on fore wings and blackish discal point on hind wings. Arizona. *Expanse* 29 to 30 mil.

CARADRINA CIVICA, n. s.

♂. This species I have known for a long time, and in vain searched for a description to fit it. A name for it may be found in B. Mus. (where it is, I think, unnamed in my coll.), but I have not noticed it. Allied to *Multifaria*, but of an ochrey and paler gray. The black costal dots evident at inception of the single faint uneven transverse lines and median shade. Subterminal line preceded by a rufous shade from below costal region. Terminal space dark. Hind wings translucent white, with narrow smoky edge, and extremities of veins soiled beneath, with costa ochrey gray terminal dots and a discal dot. Fore wings beneath ochrey gray; a discal fuscous shade and lunate mark; an extra mesial band; terminal field fuscous-shaded. Head and thorax ochrey gray; abdomen pale. *Expanse*, 30 mil. Colorado (Snow, green label, 34).

LITHOPHANE PEXATA. var. WASHINGTONIA.

Resembles the European *Ingrica* still more than the Eastern *Pexata*, but may be a distinct species from either. Thorax and abdominal tufts black. The former with white lateral patches. Fore wings black, with a yellow basal streak surmounting a longer and finer longitudinal velvety-black hair-streak. Lines faint, double. Reniform very large, stained with brown; orbicular, with a slight pale edging to its circlet. Sub-terminal line rusty-black, relieved by a paler ground; a pale yellow mark above anal angle. Hind wings fuscous, with pale fringes. Beneath with a diffuse extra-mesial band and discal mark, the ground paler, stained with brown; forewings darker. Abdominal tufts at extremity brownish. *Expanse* 42 mil. Washington Territory.

ORTHOZIA CITIMA. n. s.

Near to *Conradi*; fuscous-ochrey. Reniform constricted, long, sub-lunate, with powdery-white scales lining the ring and dark centred; claviform small; orbicular oblique, moderate, dark-centred, with powdery-white annulus. Middle of the wing ochrey; terminal field dark. Median shade oblique, apparent below;

reniform brownish. Sub-terminal line marked with white joints on the veins. Thorax dark-brownish; Head brighter colored. Abdomen pale fuscous-ochrey. Hind wings dark fuscous, with pale dirty-ochrey fringes. Beneath brighter and paler ochrey, with black discal dot on secondaries and a fuscous extra-mesial line, flexed before anal angle; fore wings darker, with clouded discal lunule and extra-mesial line. A large Hadeniform species with untufted abdomen and naked eyes. Arizona. *Expanse* 41 mil.

CUCULLIA CITA. n. s.

Allied to *Laetifica*. Very pale whitish-gray. Disk of thorax blackish. On fore wings the brown black anal streak commences below vein 2, and runs invariably and somewhat obliquely to submedian fold, along which it is more finely prolonged, entering the sulcation of the transverse posterior line, which is here legible and preceded by a faint white cloud. Short dark marks surmount the anal streak on the two superior interspaces on margin. Terminally there are white and fine dentations, enclosing the darkly marked veins. A very fine basal streak joining the deeply dentate and illegibly marked inner median line. Reniform hardly indicated. Hind wings translucent white with soiled veins and smoky edging; fringes white. Collar with a fine mesial line. Abdomen whitish-gray with dark tufts. Beneath hind wings white, fore wings gray. Arizona. *Expanse* 43 mil.

PHURYS OVALIS. n. s.

Median lines yellow, ridged, edged outwardly with brown. The ground color is a dusky ochery gray, as compared with *Vinculum*. Reniform a narrow dark lunule. Veins tending to be darker marked. A series of pale yellowish streaks on the veins connect the outer line with the dentated subterminal line, which is brown, toothed inwardly, the points formed in the veins and again connected by interspaceal streaks with the dark terminal edge of the wing. Thus a series of oval-enclosed spots are formed terminally, which is distinctive of the species, and very neatly marked and curious. Hind wings darker outside of the mesial line, which is lost at costa; a reflection of the curious terminal markings of primaries is visible. Beneath very strikingly colored, being bright ochery, immaculate, with dark leaden-hued fringes. *Expanse* 33 mil. Arizona. One fresh female example.

PSEUDORGYIA RUSSULA. n. s.

♂. Antennæ plumose; no ocelli; labial palpi prominent, much exceeding the front, with long apical joint; vestiture hair-like scales; legs slender, unarmed; front smooth; vein 5 nearer 4 than 6. The moth has a geometridous look, contradicted by the neuration and the noctuidous palpi and a distant resemblance to some pale or faded *Nemeophilæ*. From *Versuta* (the type of which I have examined) it differs in color. Pale, faded ochrey; the primaries with a slight reddish tinge and no marks except the

fragments of a diffuse median fascia. Secondaries darker, somewhat fuscous, with dot. Beneath concolorous pale warm ochrey; the secondaries with discal point. A most singular insect. From memory of the Texan example I refer it to Dr. Harvey's genus. It may be that other examples will show more markings, as my type is not very fresh, though perfect. *Expanse*, 30 mil. Arizona. Coll. Neumoegen.

CARADRINA FRAGOSA. n. s.

Slender bodied, in color paler, more brown than *Miranda*; the forewings are of a powdery pale ochrey-brown mingled with fuscous, becoming completely fuscous terminally. There are three dark vague costal marks, indicating the lines and median shade; t. p. line single, fragmentary; denticulate: t. a. line a vague shade. Orbicular and reniform minute with central white scales. Hind wings pale smoky, with pale fringes. Beneath pale smoky, without markings. Front pale; second joint of palpi dark at the side. Antennæ simple; eyes naked.

TÆNIOCAMPA VIRGULA. n. s.

This species is allied to *Agrotiformis*, with a slender body and untufted abdomen. It may be known by a black streak crossing subterminal field opposite the cell beyond the small pale reniform. General color of various shades of brown. Stigmata small; orbicular with central point, concolorous; reniform paler than the wing. No claviform. Lines single, fragmentary, blackish; s. t. line dark, upright; the terminal field following it is paler than rest of wing; s. t. line preceded by dark marks, opposite all of which one (above noted) forms a streak. Hindwings fuscous, with pale ochrey fringes; beneath paler, with line and discal dot. Head and thorax reddish brown, like primaries. Fore wings, above the veins, on subterminal field, are marked with blackish; the t. a. line is accented by following dark dots, dentate, and looks double; t. p. line waved. Antennæ simple. *Expanse*, 25 mil. Arizona.

AGROTIS TEXANA. Grote, Proc. Ent. Soc. PHIL., Vol. II., Pl. VI., Fig. 2, (1863.)

A female specimen of this species is contained in Mr. Neumoegen's collection from Arizona. It expands 38 mil., and is less distinctly marked than my figure, but the example is not quite fresh. It seems to me a good species, allied to the common *Ypsilon* and *Saucia*, but of a much lighter ochery fuscous color. It is strange that I have seen so few specimens of this species since I described and figured it twenty years ago.

TRICHOPOLIA. n. g.

Eyes hairy, lashed; tibiæ unarmed. Male antennæ simple, or finely bipectinate tapering to tips. Abdomen exceeding hind wings, with reduced basal tuft. Thorax hairy without defined tufts. Form like *Heterocampa*. Hind wings white or whitish in both sexes without sub-apical sulcation. Wings entire, straight

along costa; apices determinate; outer margin a little rounded and rather short, the inner margin being sub-parallel with costal and in *T. Dentatella* with a rounded, basal enlargement. The insects have a resemblance to some *Heterocampæ* (*Celtiphaga*.)

TRICHOPOLIA DENTATELLA. n. s.

♂. Very dark grayish fuscous with a greenish or olive cast. Markings illegible; the three stigmata indistinct; moderate, sub-equal, outlined in black. Terminal space with interrupted dashes. Hind wings white, with terminal dotted line. Antennæ bipectinate. Thorax like fore wings, with a greenish cast, indistinctly marked. Arizona.

TRICHOPOLIA PTILODONTA. n. s.

♂ ♀. Entirely dark grayish fuscous; male antennæ simple. No greenish or olive cast whatever. The stigmata are concolorous, outlined in black, reniform large; claviform wide; orbicular with a central dot. Lines indistinct. Hind wings white; soiled in female, with dotted mesial line; beneath with discal point. Thorax like primaries. Two females; one male. Arizona. J. Doll.

This looks like *Dentatella*, but differs by the want of any olive tinge, the simple antennæ of the male and the larger, better defined stigmata. Both, but especially *Dentatella*, look like small Notodontidæ. The hairy, lashed eyes, the Notodontiform abdomen, the general shape of the wings, seem to unite the two species, although the male antennæ are very different. Before examining the frenulum I took the three specimens of *Ptilodonta* for females of *Dentatella*. If, as the plainly single frenulum of one *Ptilodonta* assures me, I have made no mistake; it is yet possible that a different genus must be used for the second species.

LITHOPHANE GAUSAPATA, n. s.

Allied to *Petulca*. Entirely of a dull purple red, the primaries showing a gray bloom. Fore wings with the two mesial lines brown, sub-parallel, outwardly oblique from costa, more or less fragmentary and indistinct. Reniform a rusty yellow stain. Claviform indicated in pale, with a small brown following mark. Hind wings and abdomen dull red; beneath a brown discal dot on secondaries. Frontal tuft a little darker beneath. Soda Springs in October (Behrens). One bred specimen, the wings on the left side a little unexpanded. The markings are simple and the species readily detached; it is much darker and more richly colored than its eastern allies *petulca*, *ferrealis*, etc.

AGROTIS PERFUSCA, n. s.

All the tibiæ spmre; allind to *Cochranii* (*messoria* Harris teste Riley), but uniformly dark fuscous leaving all markings illegible. Smaller than *Pastoralis*. Stigmata concolorous, moderate; orbicular round; reniform wide; both marked by whitish scales and similar scales dispersed along s. m. fold. Hind wings fuscous. Abdomen flattened. Beneath paler; hind wings with

two shade bands and discal mark. *Expanse*, 34 mil. One female. Soda Springs, Cal.

CEA. n. g.

Allied in form, texture and vestiture to *Trichocosmia*. Eyes naked, unlashd. Vestiture narrow—scaly. Form slight, weak, tegument pale. Antennæ simple. Colors pale, a little silky. Front wide, rising to an embossed protuberance, around which the short clypeal vestiture circles; infra-clypeal plate distinct. Ocelli. Labial palpi slender, rather weak, with elongate third joint. Vestiture not strongly adherent and not hairy. White, immaculate; fore wings very pale yellow. Tibiæ unarmed. Legs weak, not hairy. Abdomen very little exceeding hind wings, with dorsal carina. Body untufted. Wings entire, rather broad and short; apices determinate, and outwardly the primaries are full.

CEA IMMACULA. n. s.

Form of *Calymnia*. Thorax and primaries very pale yellow, almost white, immaculate. Hind wings pure silky white above and below, without marks. Body white. Arizona. *Expanse*, 27 mil.

AGROTIS APPOSITA, Grote.

Fresh specimens from Soda Springs show that the body has a purply tinge beneath reminding one of *Lithophane*. It belongs to the group with unarmed fore tibiæ. It may be known by its purple-black wings shaded centrally with rusty-red and pale about the median lines and with obsolete stigmata. Hind wings blackish fuscous. *Expanse*, 36 mil.

PYROPHILA TRIQUETRA. n. s.

Tibiæ unarmed, vestiture mingled scales and hair; eyes naked, behind with very short lashes. Body smooth, somewhat flattened. Labial palpi with small conical third article rather short. Form of *Orthodes*, but distinguishable by the naked eyes. Probably not to remain here, but sharing some of the structural features of this genus. Dark fuscous; the fore wings have three unequal black marks, one above the other, preceding the subterminal line superiorly; the middle very small, the lowest the largest. Lines and stigmata concolorous, marked with pale. Hind wings and body paler fuscous. Beneath wings fuscous, paler at base, with indications of exterior dark line and without discal points. Body beneath yellowish. Palpi dark on the side of second joint. Arizona. *Expanse*, 28 mil. The black marks before s. t. line are vivid, and alone break the monotony of the wings, which are of the dirty fuscous color of *Agrotis Cochranii*, *H. Devastatrix* and other ugly Noctuidæ. It is a flattened, shiny species, looking as if it lurked under bark, where I have found *Pyrophila* and *Agrotis Clandestina* in abundance. This latter, with *Cupida*, etc., should form a subgenus of *Agrotis*.

MECOCERAS PENINSULARIA. n. s.

♂. Possibly only a modification of *Nictocris*. Dull green, with the costa at base showing a reddish shade and dotted with metallic points. A black discal dot. A median, faint, reddish shade. An outer line of dark dots, An inner dotted line hardly perceptible. Wing with sparsely scattered black scales. Hind wings with the reddish median shade, including two white cellular spots; an outer reddish line marked with dark dots; another faint line before the margin and a line of black dots on margin edged within with pale. Abdomen with four dorsal black dots at wide intervals. I find no note of this in Gueneé. Palpi ensiform or curved, with small terminal joint. Antennæ finely bipectinate. Wings entire. Feet long and narrow. Front and palpi reddish. Beneath reflecting the markings, pale; the dotted dentate line on secondaries running at variance with median shade. Indian River. *Expanse*, 40 mil.

ALMODES RIVULARIA. n. s.

♂. Possibly a modification of the Haytien *Terraria*, but quite different from Gueneé's description. Of an olive brownish, somewhat pallid; the median lines principally marked on costa by broad, dark shades on fore wings above. A median line continuous. A black discal mark and scattered elevated black scale points. Hind wings dentate, concolorous; the discal raised point black and white. Beneath costa dotted with black, with a *distinct reddish flush*; discal points black. Palpi tipped with dark. Antennæ finely and lengthily plumose. The wings above are crossed by interrupted, faint, dark lines, like a *Boarmia*; the hind wings best marked. The veins are indicated on fore wings, where the outer line is dotted. On hind wings there is a marginal black line edged within with whitish. The ground color is more brown than "testaceous;" there is a sprinkling of black scales. The color is of a cadaverous olive brown, and the insect looks quite unlike *Mecoceras*, until palpi and antennæ are compared. *Mecoceras*, *Almodes* and *Byssodes*, all occurring in Florida, give our fauna a tropical representation not before suspected. Packard mentions none of these nor *Urapteryx*. *Expanse*, 40 mil.

Properly speaking, we should not include the fauna of South Florida in our North American Lists. It must be studied in connection with that of Cuba, Hayti and Jamaica. There is a species of *Nelphe* very like *Confinis* H.-S., from Cuba. We have the following, which are either modifications of Cuban forms, or, perhaps, not even sufficiently distinct to bear a different generic or specific name. In some cases the forms are apparently distinct.

FLORIDA.

Didasys Belæ, *Gr.*
Lymire Edwardsi, *Gr.*
Cautethia Grotei, *Hy, Edw.*

CUBA.

Burtia Rubella, *Gr.*
Lymire melanocephala, *Walk.*
Cautethia Grotei, *Hy, Edw.*
 = *Noctuiiformis*, H.-S, non Walk.

Eupendosoma Floridum, *Gr.*
 Nelphe sp.
 Euhalisidota longa, *Gr.*
 Byssodes Obrussata, *Gr.*
 Mecoceras Peninsularia, *Gr.*
 Urapteryx Floridata, *Gr.*
 Almodes Rivularia, *Gr.*

Eupseudosoma niveum, *Gr.*
 Nelphe Confinis H.-S.
 Euhalisidota fasciata, *Gr.*
 Byssodes Argentata, *Dr.*
 Mecoceras Nitocris, *Cram.*
 Urapteryx Paitia, *Cram.*
 Almodes Terraria, *Guen.*

It is difficult to separate the Brazilian and Guiana species from certain Florida insects. As a rule, the East Coast species are not the same as the South Texan and Mexican. And we shall have to examine, finally, the whole American intertropical fauna, to get a proper notion as to distribution. With regard to the Florida fauna, the species must be named separately if there exists any ground for believing them distinct, although we shall have to wait for large collections to finally decide as to their specific standing.

FLOWERS ATTRACTING INSECTS.

BY MRS. C. H. FERNALD, Orono, Me.

Most people love flowers and cultivate them for their beauty and fragrance, but to collectors of insects some of them have a double charm, for they attract some of the most beautiful and rare Lepidoptera.

It has been suggested to me to mention some of the plants to which certain insects are attracted in this locality. The common lilac (*Syringa vulgaris*) and the Tartarian and Siberian honeysuckles, when in full bloom, during the hottest hours of a bright, sunny day, are a perfect paradise for several of the Lepidoptera, as well as numerous Hymenoptera and Diptera. The gaudy *Papilio Turnus* sails proudly over the highly-scented flowers, frequently dropping down to sip the nectar; and *Hemaris Diffinis* and *Thysbe*, with an occasional *Gracilis*, whiz about among the flowers as "busy as the bees." Then at twilight the larger Sphinx moths, *Gordius* and *Chamannerii*, and rarely *Luscitiosa*, dart swiftly from shrub to shrub, and from flower to flower, requiring a quick eye and hand to capture them. *Heliophila Albilinea*, *Plusia Simplex* and *Precautionis*, and occasionally a *Bimaculata*, are also taken on these flowers. Rarely the beautiful and choice *Lepisesia Flavofasciata* is found on the lilac, but always in a worn condition; better specimens are taken earlier on apple-blossoms, and the best one ever captured in this place was found still earlier on *Amelanchier Canadensis* in the woods. I have captured more insects on *Oenothera Lamarckiana* than on any other plant. A plot about three feet square gives from fifty to one hundred fresh flowers about four inches in diameter every even-

ing, and if the seed pods are picked off they can be kept in bloom for three months.

The most common insect upon this plant is *Sphinx Chersis*, then *Drupiferarum*, *Kalmiæ Undulosa*, *Hylæus Harrisii*, and, later, *Lineata*; and of the Noctuids, several species of *Heliophila* are common, *Nephelodes violans*, *Apamea Nictitans*, *Drasteria Erecta*, *Plusia Mortuorum*, *Ampla*, *Putnami*, and also those which frequent the lilac. It is the home of the beautiful *Rhodophora Florida*, which are found in the morning tucked away, head downward, in the half-closed flowers, the yellow tips of their wings just showing among the stamens. They look so cosy, it seems almost cruel to shake them out into the cyanide bottle, but in this way many perfect specimens may be obtained. They breed so freely upon this plant that it is difficult to preserve the buds entire, as the larvæ eat round holes into them, in which they nearly bury themselves. When the buds are all gone they will feed upon the decaying flowers and the seed pods, boring into them in the same manner. The stalks of this plant also contain a Tineid larva, *Laverna? Eloisella*, Clem. Several Geometers are also attracted to the Oenothera, and I have bred *Glaucopteryx Cumatilis* from it. The rare *Plusia Striatella* and *Putnami*, and all the more common Plusias, are found hovering over the single white Petunia. The climbing honeysuckle attracts *Plusia Balluca* and *Bimaculata*, as well as the common species, and also many of the same Sphinx moths as the Oenothera. I have taken several of the before-mentioned Noctuids also on Perennial Phlox and Annual Larkspur, and doubtless should find more on these plants were it not for the much more fragrant Oenothera and Petunia's close by. Possibly other species might be captured at the flowers, but as I sugar for moths on the garden fence, many may prefer the sugar to the flowers. Mr. L. W. Goodell, of Amherst, Mass., kindly informs me that *Datura Wrightii*, *Nicotiana affinis*, *Sweet Alyssum*, *Sweet Mignonette*, *Sweet William*, *Verbena Montana*, *Mirabilis longiflora*, and the old *Clove Pink*, are also more or less attractive to insects.

A NEW NOTHRIS FROM ILLINOIS.

BY D. W. COQUILLETT.

NOTHRIS TRINOTELLA. n. sp.

Reddish-brown, with three white dots near the center of each fore wing, the outermost dot crossed by a black dash; expands 11 m. m. Head pinkish-brown; basal joint of palpi dark brown outside, whitish inside, upper side of terminal tuft pale pinkish; terminal joint dark brown; antennæ pale yellowish ringed with dark brown, the basal joint wholly dark brown, Thorax reddish-

brown. Primaries reddish-brown, inclining to pink, and sparsely dotted with black; near the center of each are three white dots arranged somewhat in the form of a right-angled triangle, its base next the base of the wing, the upright next the costa; the two dots forming the base of the triangle have a dark spot on that side of them which is nearest the body, and the third dot is crossed transversely with the wing by a black dash; fringes slightly paler than the ground color. Secondaries dull leaden, unmarked; fringes dusky, becoming lighter next the body. Under side of primaries deep brown, the costal and apical margins marked with pale yellow. Under side of secondaries dull leaden, marked along the costa and at the apex with light yellow and brown. Abdomen brown, marked with pale yellow, which on the ventral surface forms two lines; legs brown, the points marked with pale yellow.

Described from a female bred from a larva found in a folded leaf of Hazel. It was sent to Lord Walsingham, who returned it labelled "Nothris sp.;" I sent a brief description and a sketch to Mr. V. T. Chambers, who replied that he was unacquainted with it and believed it to be a new species.

THE PINE MOTH OF NANTUCKET.

A REVIEW BY A. R. GROTE.

Mr. S. H. Scudder has just published a pamphlet with the above title, containing a colored lithographic plate illustrating the subject of the treatise. The pamphlet is one of the publications of the Massachusetts Society for the Promotion of Agriculture, and contains 22 pages of large print, including an appendix extracted from Professor Comstock's Government Report bearing on the subject. The moth *Retinia Frustrana*, Scudd., which injures the pine (*P. Rigida*) trees in Nantucket, is a new species with European allies, and the description of its ravages, the facts of its history, and its appearance in three stages are elaborately described and scientifically treated by the author. The remedy, to break off the affected buds in June and burn them, is feasible from the limited extent of the plantations and their insular position. It is clear that in this case the moth *can* be exterminated; the question is one of cost and labor, and whether it is worth while. If the moth really only occurs on Nantucket, we should be sorry to destroy the pretty species. This does not seem likely, however, and if the species threatens to destroy the pines, there is no question but that it would be better to destroy the moth and act upon Mr. Scudder's very sensible suggestions. The pamphlet is remarkable for the clear statements, the absence of bombast, and the thorough comprehension of the subject displayed by the author.

OBITUARY.

G. W. BELFRAGE.

To the grief of the entomological world, this excellent collector and amiable man was stricken by death on December last at his home, Clifton, Bosque Co., Texas. The materials for a biographical sketch of Mr. Belfrage's life are but scanty, but from an intimate friend of his for many years the following brief memoranda have been obtained. He was born in Stockholm, Sweden, and at the time of his death was about 50 years of age. He was descended from an old family of the Swedish nobility, and began life as a soldier, but the military profession was distasteful to him, and his early acquired love for natural history caused him to resign his commission and to emigrate to the United States. He first resided in Charleston, S. C., then for a brief period in New York City, and afterwards, for about two years, in Chicago. In all these places he formed large collections, chiefly in Entomology, and in 1867 he made his home in Texas, his explorations in that little known State being productive of most valuable results. He traversed a large portion of the State, and the many new species discovered by him bear ample testimony to his energy and power of observation. His correspondence, both in this country and Europe, was very extensive, and it is to be regretted that that he did not leave behind him some permanent records of his knowledge of his favorite science. His health never very strong, broke down under the fatigue and exposure to which he had subjected himself, and after an acute illness of several weeks' duration, he closed his eyes upon the world on the 7th of December, 1882. Mr. O. Solberg, who has kindly communicated these few facts with reference to Mr. Belfrage, says of him: "When he left us, he left no enemies, but many friends, all of whom will greatly miss him, and always cherish his memory." It is probable that his collections will be forwarded to Stockholm."

H. E.

NOTES ON LEPIDOPTERA.

ON TWO CLOSELY ALLIED TARACHE LARVÆ—TARACHE ERASTROIDES, Guen. The description of this larva which I gave on page 8, Vol. I., of "PAPILIO," also includes the larva of *T. candefacta*, Hubner. The chief differences in these two larvæ are to be found in the markings of the head; in *erastroides* the head is green, mottled with black, brown and whitish; while in *candefacta* it is striped vertically with alternate whitish and green lines, the latter sometimes tinged with purple. The food plant of the two species is the same—*Ambrosia artemisiæfolia*. Two larvæ of *erastroides* pupated about July 24th, and the imagos issued August 5th and 6th. A larva of *candefacta* pupated in the latter part of July and the imago issued on the 10th of the following month. I have also found the larvæ of *candefacta* in the vicinity of Anaheim, California (my present home); they do not differ from Eastern specimens, and the food plant is the same. One specimen pupated August 22, and the imago issued September 5; the latter is considerably darker than any of my Illinois examples. D. W. COQUILLET.

APPENDAGES OF LEUCARCTIA ACREA. In response to Mr. Stretches' interesting paper on the appendages of *L. Acræa*, I would state that so far as known to me, they were first observed by the late Mr. C. T. Robinson, who showed me a preparation of them at his residence in Putnam County, N. Y. I believe, also, Mr. Morrison very fully published them in *Psyche*; I have not his paper to refer to. Mr. Robinson made notes on this discovery, but they were not published; I have alluded to their existence in *Ann. N. Y., Lyc. Nat. History*. A. R. GROTE.

In the February number of "PAPILIO" Mr. R. H. Stretch asks if any Eastern entomologists have found the peculiar abdominal organs of *Leucarctia acraea*, Smith, which he describes. While dissecting a male moth of this species in July last, I saw these organs. I afterwards examined many other specimens, and always found them present. I also examined allied species, and found them in *Pyrrharctia Isabella*, Smith. As I could find no mention of them in any accessible works on entomology. Prof. A. J. Cook kindly took some specimens to the Montreal meeting of the A. A. A. S. He showed them to Prof. C. H. Fernald, who pronounced them to be scent organs. The hairs on the membranes of the appendages in *P. Isabella* are white. They may be seen in dried specimens by dissecting away the upper posterior portion of the abdomen.

CLARENCE M. WEED, Lansing, Mich., April 9, 1883.

EARLY APPEARANCE OF HYPHANTRIA CUNEA, Drury. Two specimens of this moth have been taken here this Spring, one on March 19 and the other on April 14. The first was found in the house on a window, while the second was captured out of doors: I think it an interesting and not generally known fact that this insect is to be found so early in the season.

WM. T. DAVIS, Tompkinsville, Staten Island.

PAPILIO.

Organ of the New York Entomological Club.

Vol. III.]

May and June, 1883. [Nos. 5 and 6.

NOTE.—Owing to the absence of the Editor from New York, it was impossible to produce the May number in proper time. It is hoped that the contents of this double number will compensate for the delay. (Issued July 10, 1883.)

ON THE POLYMORPHISM OF LYCÆNA PSEUDARGIOLUS. BOIS.

BY W. H. EDWARDS.

This paper, nearly in its present form, was read at the Montreal meeting of the Am. Assn. in 1882. Some additions and alterations have been rendered necessary by the receipt of Mr. Morrison's collections of 1881, and by further information respecting *L. Piasus*. Coalburgh, W. Va., April 1, 1883.

L. Pseudargiolus received its specific name in 1833, but Abbot had figured it in 1797, Ins. Ga., as *Argiolus*, mistaking it for the European species of that name. In 1862, I described as *Neglecta* what has since been found to be a co-form with *Pseudargiolus*, in W. Va., and the usual northern type of the summer generation. I also described *L. Violacea*, from W. Va., in 1866. At that time, very little was known of the polymorphism of butterflies, seasonal or other, and, moreover, that was a phenomenon which was only discoverable by breeding from the egg, and nothing whatever was known of the preparatory stages of any one of these supposed species.

Kirby had described *L. Lucia*, in *Fauna Boreali Americana*, in 1837, and, fortunately, had given a well executed and colored figure of it. His description does not agree with his figure, varying in several important particulars; but as he says that only one specimen was taken by the Expedition, I apprehend that the careful figure should be our guide, rather than the less careful description, especially as the figure really represents a common boreal form of the butterfly. The description says: "Wings above silvery-blue; the secondaries are brown underneath and spotted with black and white; towards the posterior margin the white spots are arranged in a transverse band parallel with it, and, as in the primaries, the wing terminates in several obsolete eyelets." The synopsis of character which precedes the description differs

from the latter, thus: "Secondaries underneath *brownish-ash color*, spotted with black and white." One says "brown," the other "brownish-ash color."

The colored figure shows the basal area of secondaries to be whitey-brown, and there is a conspicuous blackish, triangular patch on the disk at the origin of the median nervules, of which the text is silent; the extra discal area is scarcely whiter than the basal, and is not composed of white spots, as would be understood by the description. It is merely the uninterrupted white ground of that part of the wing. Also, the margins by no means represent obsolete eyelets, as stated, but heavy dark confluent crenations.

I believe the typical *Lucia*, as our collectors understand it, has a more or less conspicuous black discal patch, as indicated in Kirby's figure, and a heavy black border. As witness to this, Mr. Scudder, *Can. Ent.*, VIII., 62, describes *Lucia* as having the spots of the under hind wing "very large, usually completely confluent, and often suffusing nearly the whole base of the wing; and the marginal markings tend to form a broad band, etc." This agrees well with the figure, whereas the description might pass for *Violacea* of a silver-blue shade, and on which the white scales of under side had been partially denuded, so as to disclose the brown sub-color, thereby leaving the white area somewhat macular. The fringes are white and black alternately.

The typical *Violacea* is violet-blue above, light grayish-white beneath, and all of one shade, there being nothing macular in it, with dark points across the disks, and pale dusky crenations in outline on the margins. But while, in W. Va., violet is a prevailing color, many are lavender-blue, or silvery, and some, especially females, are metallic blue. The range of color embraces all the shades which are to be found in the northern corresponding forms. The fringes are either white and black as in *Lucia*, or on the hind wing white altogether. At the extreme north, the under side of *Violacea* is not so white and pure as in the type, the brown sub-color appearing more or less. The southern *Violacea* considerably approaches *Neglecta* in color of both sides.

Now, in addition to the above-named and described forms, which stand at the extremes of the series, there is another midway between *Lucia* and *Violacea*, and distinctly characterized. The males are silvery-blue and as often violet-blue, the females almost always metallic blue, of the shade spoken of as sometimes seen in the Virginian *Violacea*. The fringes white and black, as in *Lucia*. The ground color of secondaries underneath is whitish, and continuous, and the marginal crenations are very heavy, confluent, black, making a conspicuous band. There is no discal patch, and therein it differs from *Lucia*; the marginal band separates it from *Violacea*. This form is as unknown in Virginia as is *Lucia*,

but seems to prevail in New York, New England, and Quebec, at least in the region about Montreal. I call this *Marginata*. It has passed sometimes as *Lucia*, sometimes as *Violacea*, but by separating it we shall get a clearer idea of the species. Of course, these three forms, distinct as they are generally, all vary, and one approaches the other, or glides into the other, by intermediate examples, but I should say that forty-nine out of fifty individuals, no matter where found, would range under one of these names. They all belong to the same species. *Lucia* without the black patch is *Marginata*, and *Marginata*, without the black and heavy border, is *Violacea*. They are three phases of the winter form of the species, and whether we call them trimorphic forms, or three varieties, makes no difference in the result. At any rate the two extremes, *Lucia* and *Violacea*, differ materially.

In W. Va., *Violacea* is the sole representative of these forms, there being no examples so far known approaching *Lucia*, and very few indeed approaching *Marginata*, even by a slight deepening of color in the marginal band. And it has acquired a melanic male not before observed. Mr. Morrison took the same melanic male together with both *Violacea* and *Neglecta* in south Colorado.

In many seasons, the blue males swarm in my neighborhood, and assemblies of scores and hundreds may be met with along the water courses, early in April, or in the last days of March. The first generation vastly outnumbers its apparent second one, which is made up of *Pseudargiolus*, flying in May, and *Neglecta*, in June, and is now very abundant. Sometimes, with the early butterflies, a few individuals are taken which combine the features of both *Violacea* and *Pseudargiolus*, the males having the upper surface colored as in the latter, but the under marked like the other, and often more emphatically than in the type. I have such a mixed example from south Colorado also.

Precisely at what line *Lucia* and *Marginata* are suppressed, or where the melanic form comes in, I am not able to state. Dr. Jno. Hamilton, of Allegheny, and Rev. W. J. Holland, of Pittsburgh, both assure me that the black male has never been seen by them in Pennsylvania. To the west, Dr. H. S. Jewett, at Dayton, Ohio, has never seen the black male, though blue *Violacea* flies there. Mr. H. K. Morrison tells me that in western North Carolina both the black and blue forms are found. Mr. E. M. Aaron, now of Philadelphia, but formerly of eastern Tennessee, says that all the West Virginia forms of the species are found in Tennessee, North Carolina and Georgia. Abbot, in the Insects of Georgia, figured *Pseudargiolus* as *Argiolus* (of Europe) and its larva and chrysalis.

The typical *Pseudargiolus* is large, sometimes expanding 1.4 inch, and from that down to one inch. *Neglecta* expands from .8 to 1 inch. As a rule, the disk of forewing in *Pseudargiolus* ♀ is whiter than in *Neglecta*, and the under side of both sexes is

purser white, with fewer and less distinct marks; and the disk of hind wings of *Neglecta* is pale, with a deep blue marginal border, while in *Pseudargiolus* both wings are of one hue. The northern summer form is *Neglecta*; in the south, *Pseudargiolus* flies in May and *Neglecta* in June, and, as I shall show, have not a direct relationship with each other notwithstanding the resemblance.

We have therefore *Pseudargiolus*, *Neglecta*, *Marginata*, *Violacea* and the melanic male (originally supposed to be the female) of the latter, all going to make one polymorphic species. I propose to show what is known of the inter-relationship of these forms.

1. In the high boreal regions both *Lucia* and *Violacea* fly.

I have *Violacea* from St. Michael's, Alaska; also from Anticosti. And *Lucia* from Anticosti and Lake Winnipeg. Kirby's *Lucia* was taken in lat 54°, or about as far north as the upper end of Winnipeg. Mr. Couper, who collected for two seasons on Anticosti, is confident that no butterfly can be double-brooded on that island, by reason of the short and cold summer. Probably at St. Michael's all species are monogoneutic also. As only two examples were received from this locality, both of which were *Violacea*, we cannot tell whether *Lucia* flies there or not. Very probably it does, and, if so, these two forms in Alaska as well as on Anticosti equally represent the species. Being single-brooded, they together stand for the parent species. They are the primary or winter generation. As the species has extended to the south, where a second generation was permitted, *Neglecta* is derived directly from it.

2. In a belt of latitude covering part of Canada and British America, and southward to Long Island at the east, and Racine, Wisconsin, at the west, we have *Lucia*, *Marginata*, *Violacea* and *Neglecta*. The three forms of the winter generation appear, in the territories they all inhabit, at the same period of the year. Neither precedes the other in time.

I give a table of localities of both the winter and summer generations, as they manifest themselves; also adding *Piasus* to bring the entire sub-group into one view.

Now as to the three members of the winter form appearing at the same time of the year. At my request, several gentlemen undertook very kindly to pay special attention to this point, the present year. Unfortunately, in most localities, this has been the most wretched conceivable season for butterflies, and Mr. Hulst is the only person who has met with the species we are considering in any numbers.

1. Dr. E. C. Howe, Yonkers, N. Y., says: "All these forms do really occur here, and at the same time."

2. Rev. George D. Hulst, of Brooklyn, N. Y., between 17 April and 19 May, took 118 ♂ 31 ♀. The first example was a ♂

TABLE OF LOCALITIES—WINTER AND SUMMER GENERATIONS.

LUCIA.	MARGINATA	VIOLACEA.	SAME. BLACK MALE.	VIOLACEA CINEREA.	NEGLECTA.	PSEUDARG.	PIASUS.
Anticosti. Winnipeg. Montreal.	Montreal.	St. Michaels Anticosti. Winnipeg. Montreal.			Montreal.		
Orono, Me. Boston. Albany, N. Y Yonkers, " L. Island. Racine, Wis.	London, Ont Orono. Yonkers. L. Island. Racine.	Orono. Boston. Albany. Yonkers. L. Island. Racine.			London. Orono. Boston. Albany. Yonkers. L. Island. Racine.	Racine.	
		C'lb'h, W. V. Dayton, O. Carb'ale, Ill. W. N. Car. Georgia. E. Tenn. Montana.	Coalburgh.		Coalburgh.	Coalburgh.	
	Montana.		W. N. Car. Georgia. E. Tenn.		W. N. Car. Georgia. E. Tenn.	W. N. Car. Georgia. E. Tenn. Montana. Nevada.	
North Colo.		S. Colorado.	S. Colorado.	S. Arizona.	N. Colorado. S. Colorado.	S. Arizona.	
		Mt. H'd Or.			S. California	Arizona.	Arizona. California.

Marginata 17th April; on the 19th, 1 ♂ same and 1 ♂ 1 ♀ *Volacea*; on 22d, 3 *Lucia*, two of which displayed very large patches on hind wings, 7 *Marginata*, and 4 *Violacea*; on 24th, 2 *Lucia*, 11 *Marginata*, 7 *Violacea*; on 1st May; 6 *Lucia*, 22 *Marginata*, 23 *Violacea*; on 8th May 11 *Lucia*, 18 *Marginata*, 14 *Violacea*; May 16, 4 *Lucia*, 7 *Marginata*, 3 *Violacea*. I would have been glad of many other statements, and should have received them had the season been propitious, but this one, made by an experienced and careful observer, and extending through several weeks, tells the story as completely as if a dozen had been sent me. Mr. Hulst further informs me that he happened to have a lot of these butterflies caught one day in the spring of 1881, 41 specimens in all. That of them 8 are *Lucia*, all but three having the patch of large size, 24 are *Marginata*, and 9 *Violacea*; and speaking in general of these forms as they appear at Brooklyn, he says that *Lucia* is common, *Marginata* takes in the bulk of the specimens, and *Violacea* is not unfrequent.

3. Rev. Thos. W. Fyles, of Cowansville, P. Q., sends a table of his captures:

On 22nd May, 3 *Marginata*.

“ 27th “ 2 “

“ 31st “ 1 “

“ 2nd June, 4 “ and 2 *Lucia*.

“ 12th “ 1 “

3. Eggs laid by *Violacea*, in April or early in May, in W. Va., produce *Neglecta*, in June, so far as known, but most of the

chrysalids hibernate. The eggs are laid on Dogwood, *Cornus*, in April. This was ascertained in 1878 only. On tying a female over the end of a branch, about 40 eggs were obtained within a few hours, laid among the flowrets. This was 14th April. The duration of the egg stage was 5 days, of the larval, 24 days, and the first pupation took place on the 13th May; on 6th June, or 24 days after pupation, there emerged a *Neglecta* ♀. The whole period, therefore, from egg to butterfly, was 53 days, and observations in successive years show that the duration of the egg and larval stages is just about the same as in the case stated; that is, 29 or 30 days. I have never had a butterfly from *Violacea* chrysalis except in this one instance. Some of the chrysalids of 1878 were alive late in the summer, and the presumption is, would have successfully hibernated, if I had had the skill to manage them properly. But about middle of September all were found to be dead. And in subsequent years, I have lost them without getting a butterfly. They either dry up or mould. In nature, these larvæ fall to the ground when full grown, and no doubt conceal themselves under sticks and stones for pupation. I made my plans for the present season (1882) to breed from *Violacea* and *Pseudargiolus* largely, with the hope of clearing up any yet obscure parts of their history, and received advice from Mr. William Buckler, of England, who has had great experience in rearing lepidopterous larvæ, as to the way of preserving a just medium between dryness and too great dampness with the chrysalids, but have been able to do nothing, getting neither eggs nor larvæ. Inasmuch as *Violacea* is so excessively abundant in April, it is not possible that the few late females of *Pseudargiolus*, which lay eggs in September, can be the parents of all this host, and I infer, in consideration of the fact that the hibernating chrysalids of the May generation (*Pseudargiolus*) produce their own form of butterfly only so far as yet known, and also that the larger part of the chrysalids of *Violacea* appear to hibernate, that nearly all the butterflies of the first generation must come in direct descent from their own form of the year before.

4. Eggs laid by *Pseudargiolus* produce the same form the same year in very small numbers, but most of the chrysalids hibernate to produce the same form the next spring. The few butterflies which emerge the same summer are sometimes as large as the parent female, but usually are smaller. I have never actually carried one of the chrysalids over the winter to imago in the spring, but there can be no doubt that *Pseudargiolus* of May come from hibernating chrysalids, and I will make it clear that any other assumption is impossible. The food plant of *Pseudargiolus* is Rattle-weed, or otherwise called black snake-root, *Cimicifuga racemosa*. That the females laid their eggs on this was only ascertained in 1877, and early in July, I had got about 30 chrysalids by raising the larvæ. (The duration of the several stages are as fol-

lows: egg, 4 days; larva, 19 at the least, or 23 days from laying of egg to pupation. From that to 28 days.) On 19th August, 1 ♂ *Pseudargiolus* came forth from chrysalis; 1 ♀ 1st September, and 1 ♀ between 3rd and 20th September, while I was absent from home. The other chrysalids were alive at the beginning of winter, but 19th February, 1878, were found, on examination, to be dead. I opened their wing cases, and most had the full color of *Pseudargiolus*, a few showing no color at all. It is well known that the color of a butterfly's wing begins to set but a short time before the imago is to issue from chrysalis, and when the color is complete the insect is ready to burst the shell. Most of my chrysalids then, at some date in the winter, had been fully ready to give *Pseudargiolus* butterflies, but just at that point they had died.

In 1878, I had a great number of larvæ. On one day, 19 June, I found 50. On 13th July, emerged 1 ♀; on 4th August, 1 ♂; on 10th August, 2 ♀; and no more issued. I had tried to keep these chrysalids damp on moss sprinkled with water, but on 12th September found that all were dead with mould.

In 1879, I carried upwards of 20 chrysalids, obtained in July, through the summer and fall, with no emergence except on 14th September, when a ♀ *Pseudargiolus* came out. The rest were alive in early winter, but were found to be dead 19th January.

In 1881, I had 3 chrysalids that certainly were alive 20th February, 1882, and that day they were removed from the house to the open air, the weather becoming moderately warm. This was with the hope that the butterflies would soon begin to come forth. But some time in March I found all of them dead. On opening the wing cases they proved to be 2 ♂ 1 ♀ *Pseudargiolus* in full color.

This season, 1882, I could get but two chrysalids, one of which formed 3d July, and gave a full-sized female 15th July, or after 12 days. The other, on 27th July, gave a medium-sized ♀ after but ten days pupation.

In corroboration of the observations based on the chrysalids, I will give others upon the appearance of the butterflies in the field, and these can have no other interpretation than that *Pseudargiolus* of May must come altogether from hibernating chrysalids. I recall the facts before stated, that the duration of the egg and larval stage in the first generation (or *Violacea*) is about 30 days, and that the only butterfly known to emerge from chrysalis proceeding from *Violacea* was *Neglecta*, after a period of 24 days from pupation, making 63 days from egg to butterfly. The egg was laid 14th April, and the *Neglecta* came out 6th June. Now it will be seen that year after year the first appearance of *Neglecta* has been in the early days of June, while *Pseudargiolus* has been on the wing, in fresh examples, at the time that *Violacea* eggs were being laid. In fact, *Pseudargiolus* is always plenty before the

larvæ from *Violacea* eggs have reached chrysalis, and has totally disappeared when *Neglecta* begins to come on the stage.

1865, 22d May, took 3 *Pseudargiolus*; on 15th June, 3 ♂ *Neglecta*, the first seen.

1866, on 13th and 14th June, took 30 ♂ *Neglecta*; on 1st July, 1 ♀, the first seen.

1867, 11th May, took 6 ♂ *Pseudargiolus*.

1868, 1st " " 1 ♀ " the first example seen.

" 14th " " 14 ♂ ♀ "

1869, 29th " " 15 ♂ "

" 6th June " 1 ♀ " on 20th June took several *Neglecta*.

1870, 15th May, took 5 ♂ *Pseudargiolus*.

1877, 29th " " 3 ♀ "

" 2d June " several ♂ "

1878, 13th to 17th April, found the first eggs and nearly hatched larvæ of *Violacea*. On 19th, 20th, 21st April, took each day a fresh ♂ *Pseudargiolus*. On 1st May 5 ♂, and 3d May, recorded that the species was abundant. On 6th June, a *Neglecta* (before mentioned) came from chrysalis from *Violacea*. On 9th June, took several *Neglecta*, and recorded that no more *Pseudargiolus* were to be seen.

1879, 1st to 6th May, was daily finding eggs and larvæ of *Violacea*; 9th May, took 1 ♂ *Pseudargiolus*.

" 11th " " 1 ♀ "

1880, 2d May, took 2 ♂ *Pseudargiolus*: On 30th May, took 23 ♂ *Neglecta*.

1881, 8th May, found the first larva of *Violacea* of the season; same day, saw first *Pseudargiolus* flying. 16th they were plenty; On 7th June, *Neglecta* were flying, fresh from chrysalis; took 5 ♂; on 22 June, they were plenty.

1882, April 6, took several fresh ♂ *Violacea* in a cluster on the ground, and with them were two ♂ *Pseudargiolus*, earlier by a month nearly than I had ever seen them.

The observations on the chrysalids and those on the appearance of the butterflies in the field therefore agree, and together show that *Pseudargiolus* of May cannot proceed from *Violacea* butterflies of that year, but must come from hibernating chrysalids. The later butterflies, *Neglecta*, which follow closely the others, and begin their flight about June 1, and are not in large numbers, as a rule, must come from *Violacea* butterflies of the same year. A small percentage of the chrysalids from *Violacea* give butterflies at fifty and more days from the eggs laid in April, which brings the emergence into June, and the result is *Neglecta*; while nearly all the chrysalids hibernate, as before said, to give *Violacea* the next spring.

In a paper in *Can. Ent. Vol. X.*, p. 1, 1878. I stated my

belief that *Pseudargiolus* proceeded directly from *Violacea*, and accounted for *Neglecta* by effect of climate, scarcity of larval food, etc. But later observations and a careful reading of my journals have led me to reject that theory.

Therefore, what is apparently the second generation is really but partially so. It is made up from two distinct sources, and the true second generation of the year in descent is *Neglecta*, proceeding, as it does, directly from the first generation, or *Violacea*. *Pseudargiolus* is an interpolated and distinct generation, the first in the year of its series. It has no direct connection with the winter forms, but an indirect one through the few individuals which spring from it late in the season, as I shall show.

I am not able to state what is the behavior of *Neglecta*, when it lays its eggs, or upon what plant. Inasmuch as, later in the year, only an occasional individual of the species is flying, and which can be accounted for as the product of *Pseudargiolus*, it seems to me highly probable that all the chrysalids from *Neglecta*, which would be formed in July, go over the winter, to swell the hosts of *Violacea* in April.*

5. The few late females sprung from *Pseudargiolus*, and which emerge from chrysalis irregularly in August and September, lay eggs, and the chrysalids thereupon hibernate and produce *Violacea* in the following spring.

In September, 1873, Mr. T. L. Mead, then at Coalburgh, noticed a female laying eggs on flowers of *Actinomeris squarrosa*. From these two chrysalids were obtained, but they died during the winter. In September, 1874, I found a few larvæ on same plant, and got from them three chrysalids, from which emerged 13th February, 1875, three butterflies, 1 ♂ 2 ♀ *Violacea* (as related Can. Ent., VII., p. 82.)

In 1877, so late as 13 October, I found several larvæ on *Actinomeris*, and sent them to Dr. Hagen for observations on the honey-tubes. 1878, 11 September, I had 3 larvæ from same plant, but find no mention of the chrysalids later. 1881, 30 August, I found 2 larvæ on same plant, and obtained from them two chrysalids. These gave two females *Violacea*, on 2nd and 15th March,

* While correcting the proof of this paper, 30th June, I am able to add something to the history of *Neglecta*. From *Violacea* eggs, in April of this year, I obtained six chrysalids, which formed 19 May, and within one or two days after. To the present date, or at 39 to 41 days from pupation, no chrysalis has given butterfly, though *Neglecta* butterflies have come and nearly gone. *Pseudargiolus* was so scarce that I saw but one example, a female, which I caught while it was ovipositing on Rattle weed, on 5th June. From this, tied in bag, I got eggs, and this very day 3 of the larvæ therefrom have pupated, 1 on 28th, or at 23 to 25 days from laying the eggs. On the Rattle weed, previous to 16th June, I found a few eggs and larvæ of *Pseudargiolus*, from which I have 12 chrysalids. On 9th June, the first example of *Neglecta* butterfly was seen, a fresh male, and within a week there were many. And they have nearly disappeared, and examples taken since 25th have been worn. But at this date, 30th June, the Rattle weed is still abundant, and bids fair to continue in flower two weeks longer (or long enough for all larvæ now on it to mature), and I find plenty of young larvæ, which undoubtedly are from *Neglecta*. Since 16th June, I have found both fresh eggs and newly batched larvæ. I observe that the chrysalids from eggs of *Pseudargiolus* are nearly twice as large as those of *Violacea*, averaging, length, .335 in., breadth of abdomen, .157 in.; while *Violacea* averages, length, .26 in and breadth .125. What the chrysalids from *Neglecta* measure I will ascertain in due time. But the little chrysalids of *Violacea* will not produce the large butterfly *Pseudargiolus*, and the large chrysalis of the latter will not produce the little butterfly *Violacea*.

1882. So that certainly some *Violacea* come from the chrysalids of the late *Pseudargiolus* of preceding year. But, as before said, all cannot so originate. *A. squarrosa* has furnished very few larvæ, two and three in a season, in one case ten; but if all, or any large part, of the spring butterflies came from September larvæ, the plants would swarm with the latter.

This is the history of the species in W. Va. At the north, very little seems to have become known respecting any of the preparatory stages. But 8th June, 1878, I received from Prof. J. H. Comstock several larvæ, on *Viburnum acerifolium*, supposed to be from eggs laid by *Neglecta*. None of the chrysalids therefrom gave butterfly the same season, and all were dead by 12th December. I conclude that these chrysalids would, under natural conditions, have hibernated.

On the other hand, Mr. William Saunders, in *Can. Ent.*, Vol. I., p. 100, relates that he found larvæ nearly full grown 12 July, on *Cornus*; and in Vol. VII., page 83, he further says, that of that lot of larvæ, 5 soon after pupation produced *Neglecta* butterflies. It is to be inferred that no chrysalids lingered, as no mention is made of such. Mr. Saunders says, that in his locality, London, Ont., there are two broods of *Neglecta*, one in May and June, the other in July and later. And the date of his captures, in several years, run from 14th May to 4th June; a much beaten specimen on 25th June. And fresh individuals had been taken 2d and 5th July, indicating a second brood. Mr. Saunders is confident that the winter forms of the species are not to be found in that region, not having been taken or seen, though there are many collectors at hand. At various points from W. Va. to Maine the winter forms and the flowering of *Cornus* come together, so that except for Mr. Saunders' confidence in the absence of these forms, I should infer that the eggs which produced these larvæ were laid by one of the winter forms. If that had been so, the second generation, *Neglecta*, would have followed the first in direct succession, with many of the complications seen in W. Va.

In *Can. Ent.*, X., p. 129, Dr. E. C. Howe states, that at Yonkers, N. Y., (which is about two degrees to the south of London, Ont., and being on the seaboard, has a very much milder climate), he saw several pairs of *Lucia* in copulation April 19, and females *Lucia* were ovipositing on *Cornus* April 30 and May 4, 1878, and he saw *Neglecta* males flying on April 19 and 22 that year. That single mention raises a curious point. It is plain that these *Neglecta*, flying with *Lucia*, must have come from hibernating chrysalids, as truly as did the *Lucia*. The history of these *Neglecta* would appear to be identical with the history of *Pseudargiolus* in W. Va., and they represent the southern form, and are interpolated in the series just as *Pseudargiolus* is. In fact, these early *Neglecta* would be very small *Pseudargiolus*, though perhaps undistinguishable from the examples of *Neglecta* which

come in direct descent from *Lucia* and appear later. Mr. Lintner's observations lead to the same conclusion, though confined almost wholly to *Neglecta*. He has found this form between May 12 and middle of June, in successive years. On June 9 observed four pairs in copulation. His only *Violacea* recorded appeared May 12 and 19, and same year *Neglecta* was flying from May 16 on, so that the two forms were contemporary in part of their periods. As above stated, Mr. Saunders shows two broods of *Neglecta*, the later one flying in July and August. I have taken *Neglecta*, at Hunter in the Catskills, September 8. There was no general flight, but here and there a butterfly. It is much to be hoped that further observations may be made by some of our northern lepidopterists on these forms.

As stated, I have received from Montana males of *Violacea* and *Marginata*, and both sexes of *Neglecta*; from northern Colorado, *Lucia* and *Neglecta*; from southern Colorado, *Violacea* and its black male, and both sexes of *Neglecta*; from Nevada *Pseudargiolus*, from Arizona a form slightly differing from *Violacea*, which I have called *Cinerea*; from southern California, *Neglecta* ♂ ♀; from Mt. Hood, Oregon, a female very near *Neglecta*.

[But nearly all the Pacific examples, and many from Arizona, are what Dr. Boisduval names *Piasus*. They expand from 1 inch to 1.3; in color, the males are violet-blue, the under side not quite white, but color of *Neglecta* of the Atlantic slope, and the markings are as in that form, pale but distinct. But the females are not often like those of *Neglecta*. The blue of the disk is duller than in the males, and there is no white as in the two forms named; the black border is confined to the hind margin, as in many *Lucia* and *Violacea*. The costal margin is blue in many examples; others have a fuscous wash over costal margin, and both these winter variations are found in the eastern winter forms, but not in *Neglecta*. The under side is usually more like *Neglecta* than *Violacea*. But with 12 ♀♀ sent me by Mr. W. G. Wright, came 1 ♀ closely approaching *Neglecta*, in the black borders to both margins, and to *Violacea* in the indistinct markings of under side. The upper side is deep blue, with no trace of white on disk, and therein also it differs from *Neglecta*. The female before spoken of, from Mt. Hood, is much the same as this from south California. *Piasus* evidently stands between *Violacea* and *Neglecta*. Some males in the shade of blue cannot be separated from *Neglecta*, nor can they in the appearance of the under surface, and therefore I have tabulated this form as found in California. *Piasus* first appears at San Francisco, according to Mr. Henry Edwards, "about the end of March or the beginning of April, as soon as the peach and cherry trees are in blossom." It is his opinion that in that locality there is but one annual brood of the larva. He says that there is absolutely no green vegetation in the lowlands of California after July, and there would be nothing

for larvæ later than this to feed upon. Mr. Wright, at my request, has watched the appearance of *Piasus* the present season, 1883, at San Bernardino, southern California, and has sent me many examples (35 ♂ 12 ♀). Evidently, there, there are two distinct broods. The first examples were taken in February and March, the last from 18th April to 2d May. All of a sudden the species became abundant from 18th April, after an interval of several weeks, during which none were seen. I find no perceptible difference between the ♂ ♀ of the two broods, except that in the earlier one appears the female before spoken of, which resembles *Neglecta* instead of *Violacea*; of the males, there are several individuals, which, if taken in W. Va., I should consider *Neglecta*. As I look at the matter, *Piasus* is probably an offshoot of *Neglecta* or *Pseudargiolus*, and occasionally there is a reversion to *Violacea* in some characters.]

Summing up the facts as related, with such inferences as the best observations at command will justify, the history of the species treated of will take shape as follows:

1. The winter generation, in its most northern localities, is one-brooded, and at same time dimorphic; *Lucia* and *Violacea*.
2. At a certain line, moving southward, say at or about lat. 45°, on the Atlantic, a second generation, *Neglecta*, appears; and the first, or winter, generation has become trimorphic: *Lucia*, *Marginata*, *Violacea*.
3. At another line, say at or about lat. 38°, on the Atlantic, two of the forms of the first generation are suppressed, viz.: *Lucia* and *Marginata*; and an entirely new form comes in, restricted to one sex: viz., the black male of *Violacea*.
3. But in lat. 40°, at the west, in Colorado, at high elevation, the original dimorphism prevails, *Lucia* and *Violacea*; though the latter has acquired the black male, identical with that of the east.
5. At another line, say about lat. 33°, in Arizona, *Violacea* is replaced by a modified form, *Cinerea*, and the black male apparently has disappeared.
6. On the Atlantic, from about lat. 40° or 39° and south, a second summer form is interpolated: viz., *Pseudargiolus*, from which proceeds a partial generation only the same year.
7. This partial generation produces chrysalids, which hibernate, and in the spring disclose a part of the butterflies of the first generation, or *Violacea*.
8. But most of the butterflies of the first generation are directly descended from the first generation of the year before.
9. The first generation produces a partial second the same year: viz., *Neglecta*, and this probably produces chrysalids which hibernate to give butterflies of the first generation in the spring. The first generation is therefore made up from two and, probably, three distinct sources.
10. The interpolated summer form, *Pseudargiolus*, is very

much independent of the first generation, and the latter is very much independent of its second generation, as well as of *Pseudargiolus*; and, therefore, if at any point, either was suppressed, the other could exist, and would solely represent the species. Which accounts for the form *Piasus* on the Pacific, or for the single form *Neglecta* at London, Ont.

NOTE.—Prof. Lintner, Can. Ent., VII., p. 122, 1875, stated that *Lucia* had never to his knowledge been taken in the vicinity of Albany, N. Y., or in that well-worked region, Centre, N. Y.; but that, at the latter locality, in some seasons *Neglecta* swarms in myriads: “the air has seemed blue” with them. On the next page, in a foot-note, it is said: “Since the publication of the above, *L. Lucia* has made its appearance for the first time at Centre. Examples of it were captured by Mr. W. W. Hill on the 16th May, 1876, at this locality, where it was also captured on the 13th, 20th, 26th May (5 specimens).”

In a letter to me of 22d July, 1882, Prof. Lintner says: “*Lucia* is increasing here. A young collector showed me an example taken this spring on the other side of the Hudson. He says he saw several more.” Mr. Lintner also sends me a ♀ *Violacca* taken in the Heldeberg Mountains, which are west of and near Albany.

It is plain therefore that *Violacca* and *Lucia* do fly in that region, but just as plain that the flight must be a very insignificant one, and that it cannot possibly be the parent of the vast swarms of *Neglecta* described. The latter must come almost wholly from *Neglecta* chrysalids of the year before.

In Butterflies of N. A., Part XII., to be issued this season, I shall devote two plates to the species here treated of, with all its forms and many variations; also with full larval of history.

THE LEAF-ROLLERS OF ILLINOIS.

BY D. W. COQUILLET.

The following leaf-rollers were bred by me while living at my old home near Woodstock, Ill.; they all have sixteen legs and belong to the families *Tortricidæ*, *Tineidæ* and *Pyrilidæ*. The Tortricids were determined for me by Prof. Fernald; the Tineids by Prof. Fernald and Lord Walsingham, and the Pyralids by Mr. Grote, and I would hereby acknowledge my indebtedness to these gentlemen for aiding me in this direction. I have appended to each description the initial letter of the person who determined the imago for me.

DEPRESSARIA PULVIPENELLA. Clem.

Body green, sometimes a darker dorsal line and sub-dorsal stripe; piliferous spots green; cervical shield green with a black

dot on each outer edge; anal plate edged behind with black, this sometimes broken at the extreme posterior end; spiracles brown; head green, dotted or mottled with pale brown and marked with a dot on each side above the jaws; length from 17 to 18 mm. Lives on *Solidago rigida* and *Solidago sp?* in a leaf rolled lengthwise. Several specimens examined. One pupated June 27, and the imago issued July 11. Several others were found June 23, one of these pupated June 29, and the imago issued July 13. (F.)

DEPRESSARIA ATRODORSELLA. *Clem.*

Body green; a dorsal line and sub-dorsal stripe very dark green, blackish, or brown; piliferous spots and spiracles dark brown or black; cervical shield yellowish-green, with a black spot on the middle of each outer edge; anal plate sometimes edged behind with black; head yellowish-brown, with two black dots on each side, one near the jaws and the other next the anterior edge of segment one; length 18 mm. Lives on *Bidens frondosa* in a leaf folded lengthwise. One found June 21 pupated about a week later and the imago issued July 15, another was taken July 1 and a third July 4; the date when these pupated is not known, but one imago issued July 31 and the other August 9. (F.)

DEPRESSARIA GROTELLA. *Robs.*

Body green, darkest dorsally; cervical shield green unmarked; head green, with a black dot on each side above the jaws and sometimes with one or two black spots on each side near the top; length 17 mm. Lives on hazel (*Corylus americana*) in a leaf rolled from the apex toward the base, or in a nest formed by fastening several leaves together with silken threads. Found several May 27; one pupated June 7 and the imago issued June 28; another pupated June 20 and the imago issued July 9. (F.)

DEPRESSARIA HILARELLA, *Zeller.*

Body green; a dark green dorsal and sub-dorsal line; piliferous spots green; spiracles brown; cervical shield and anal plate green, unmarked; head green, tinged with yellowish-brown; length 14 mm. Lives on *Sanicula marilandica* in a leaflet folded lengthwise. One found June 21 pupated July 2 and the imago issued July 17. (W.)

GELECHIA DISCOÆCELLA. *Chambers.*

Body, cervical shield and anal plate green, unmarked; piliferous spots and spiracles concolorous; head green, sometimes with a black dot on each side above the jaws; length 16 mm. Lives on *Polygonum pennsylvanicum*, *P. convolvulus* and yellow dock (*Rumex sp.?*) in a leaf folded lengthwise, or beneath a web spun upon the upper or under surface of a leaf. One pupated June 13 producing the imago June 20; another pupated about June 27 producing the imago July 7; another pupated about August 9 and the imagos emerged August 18 and 22. (W.)

GELECHIA AGRIMONIELLA. *Clem.*

Body pale greenish-white; piliferous spots polished black;

cervical shield yellowish-green, with two dorsal black dots near the posterior edge; spiracles ringed with brown; head pale yellowish-brown, with a black dot on each side above the jaws; anal plate unmarked; length 10 mm. Feeds on *Agrimonia eupatoria*, living in a leaf rolled lengthwise, or from the apex toward the base, or in a nest formed by fastening several leaves together with silken threads. Two pupated about June 7 and the imagos issued June 28. (W.)

GELECHIA TRISTRIGELLA. *Wlsm.*

The only difference observable between this and the above larva is that the thoracic legs in the present species are black, with whitish joints, while in *agrimoniella* they are greenish, sometimes tinged outwardly with pale brown; in the present species the spiracles are situated on the lower edge of the third piliferous spots on the abdominal segments, while in *agrimoniella* they are placed below these spots; length 15 mm. Lives on hazel (*Corylus americana*) in a tube formed by rolling a leaf from the apex toward the base, the tube is closed at each end as if done by pinching the upper and lower part of the tube together with the thumb and finger. The excrements of the larva are retained in the tube, and when about to pupate the larva crawls into this excrementitious mass and forms an oblong cavity which it lines with a very thin layer of silk. Two pupated June 21 and the imagos issued July 5. (W.)

GELECHIA RHOIFRUCTELLA. *Clem.*

Body green; piliferous spots polished black; cervical shield blackish; anal plate unmarked; head yellowish-brown, shaded with blackish; length 16 mm. Lives on poplar in a leaf rolled lengthwise and closed at each end. (According to Chambers it also lives on the fruit racemes of sumac. *Food Plants Tineina*, page 109.) One pupated June 12 and disclosed the imago June 30. (F.)

DICHELIA SULFUREANA. *Clem.*

Body green; piliferous spots whitish; spiracles ringed with brown; cervical shield green, or yellowish-brown edged each side with dark brown; anal plate unmarked; head yellowish-brown, with a black dot on each side above the jaws; length 16 mm. Lives on *Verbena hastata** in a leaf folded lengthwise. One pupated about June 18 and the imago issued June 17; another pupated July 6 and produced the imago July 11. (F.)

CENOPIS RETICULATANA. *Clem.*

Body green; piliferous spots whitish; spiracles concolorous; cervical shield yellowish-brown, edged each side with black; a black spot on each side of the anal plate; head yellowish-brown, with a black dot on each side above the jaws and a black streak

* According to Dr. Packard it also feeds upon *Pinus strobi* and *Pinus rigida* (PAPILIO, Vol. I., p. 182); while Prof. Comstock gives its food plants red and white clover, locust, strawberry, grape, cotton, orange and willow (Rep. Cam. Agr., 1830, p. 256).

back of this; length 18 mm. Lives in a folded leaf on *Chenopodium album*, and *Geranium maculatum* (According to Miss Murtfeldt it also feeds upon the rose. *Am. Ent. vol. III., page 14*). One pupated July 6 and disclosed the imago July 17. (F.)

TERAS PERMUTANA. *Dup.*

Body green; a dark dorsal line; a light-colored stigmatal line; sutures of segments sometimes yellowish; cervical shield wanting; anal plate unmarked; piliferous spots concolorous; spiracles ringed with pale brown; head green, unmarked; length 19 mm. Lives on willow, binding two or more terminal leaves loosely together with silken threads. One pupated about June 13 and the imago emerged June 27. (F.)

TORTRIX QUERCIFOLIANA. *Fitch.*

I can find no difference between this larva and that of *Gelechia discoæcella* described above. It feeds upon wild black-berry (*Rubus villosus*), living under a web spun upon the upper surface of a leaf. One pupated June 21 and the imago issued July 4. (F.)

TORTRIX PALLORANA. *Robs.*

Body green; piliferous spots concolorous; spiracles faintly ringed with pale brown; cervical shield green, unmarked; anal plate unmarked; head green, a black dot on each side above the jaws; length 18 mm. Lives on cherry, *Silphium integrifolium* and *Verbena hastata*. One pupated June 16 and disclosed the imago June 27; a third pupated July 25 and the moth emerged August 4. (F.)

CACOEZIA SEMIFERANA. *Walk.*

Body green; piliferous spots and spiracles concolorous; cervical shield green, with two dorsal black dots on the posterior edge and a black dot on each side near the head; head green, with a black dot on each side above the jaws; anal plate unmarked; length 17 mm. Lives on knot grass (*Polygonum aviculare*). One pupated June 10 and the imago emerged June 20. (F.)

LOXATÆNIA ROSACEANA. *Harris.*

Body green; piliferous spots light colored; spiracles faintly ringed with pale brown; cervical shield brownish-black, sometimes shaded with green next the head; or green, surrounded at the sides and behind with black, or bordered on each side with black, this sometimes reduced to a dot or dash near the anterior or posterior end; or green, bordered behind with black; or yellowish-brown, surrounded at the sides and behind with black and with two dorsal dots of the same color near the anterior edge; head blackish-brown, the upper part of the face sometimes tinged with brown; or yellowish-brown, sometimes tinged with green and with a black dot and streak on each side, one or both of these marks sometimes wanting; anal plate unmarked; length about 20 mm. I have bred this species from larvæ found feeding upon the apple, cherry, Siberian crab-apple, lilac, horse-chestnut

tame raspberry, wild strawberry, wild rose (*Rosa blanda*) burdock (*Lappa officinalis*), thistle (*Cirsium lanccolatum*), red clover (*Trifolium partense*), ragweed (*Ambrosia artemisiæfolia*), smartweed (*Polygonum pensylvanicum*) and knotgrass (*P. aviculare*) and have found it on burr oak, poplar, hazel (*Corylus americana*), sumac (*Rhus glabra*), wild raspberry (*Rubus strigosus*) wild blackberry (*R. villosus*), horse radish, wild sunflower (*Helianthus grosseserratus*) and blue vervain (*Verbena hastata*); and Dr. Packard has found it upon *Betula populifolia*,* making in all twenty-four different species of plants. It remains in the chrysalis state from five to eleven days, and two broods are produced in one season. (F.)

PENTHINA NIMBATANA. *Clem.*

Body green; spiracles and piliferous spots concolorous; head and cervical shield polished black; anal plate unmarked; length 15 mm. Lives in a folded leaf on *Rosa blanda*. Two were taken the first week in June; they pupated a few days later and the imagos issued June 20 and 21. (F.)

BOTIS OSCITALIS. *Grote.*

Body green; piliferous spots concolorous; spiracles ringed with pale brown; cervical shield green, edged at the sides and behind with black, that on the sides sometimes wanting; head mottled black and white; anal plate unmarked; length 16 mm. Lives in a folded leaf, or between two leaves folded together with silken threads, on willow and poplar. Found several in the latter part of July and again about the middle of August; one pupated July 27 and the imago issued about August 8. (For the generic determination of the imago I am indebted to Mr. Grote; the [single] specimen bred by me agrees very well with his description of *oscitalis* [Can. Ent., Vol. XII., p. 36], and as one of his specimens was from Ohio it is not improbable that the species ranges westward as far as Illinois).

BOTIS GENEROSA. *G. and R.*

Body green; piliferous spots and spiracles black; above the spiracles is a black stripe on which is a row of large, raised, polished black spots, those on the segments two and three the largest; head and cervical shield greyish-brown, the latter edged each side with black; anal plate unmarked; length 10 mm. Lives singly on *Monarda fistulosa*, webbing the terminal leaves together. One found June 17 pupated June 30, and the imago issued July 18. (G.)

PENTHINA HEBESANA. *Walker.*

Body green; piliferous spots and spiracles concolorous; head and cervical shield polished brownish-black; anal plate unmarked; length 11 mm. Lives singly on *Stachys palustris*, binding the terminal leaflets together. Found many larvæ and two pupæ June 24. One imago issued June 30. (In the Amer. Ent. Vol.

* PAPHIO, Vol. II., p. 182.

II., p. 204, Mrs. Mary Treat states that this species [under its synonym, *P. Fullerea*, Riley] feeds upon the cultivated Verbena, and quotes an article in which Prof. Riley states that he bred it from a Tigridia or tiger-flower), and on p. 371 Miss Murtfeldt states that she has bred it from *Antirrhinum*. (F.)

EUDEMIS BOTRANA. *S. V.*

Body purplish or dull greenish; piliferous spots and spiracles concolorous; cervical shield blackish, usually tinged with brown next the head; head brown, with a black dot and streak on each side; anal plate black; length 11 mm. Lives in the flower buds of the thistle (*Cirsium lanceolatum*). According to Miss Murtfeldt it also feeds upon the rose (Amer. Ent., Vol. III., p. 14), and many authors state that it also infests the grape, it being the well-known *Penthina vitivorana* of Packard. Riley describes the grape-feeding larva as having the head and cervical shield honey-yellow, the latter with a darker posterior margin (First Rep. Ins. Mo., p. 135). Found a great many June 24; two moths issued July 8. (F.)

BOTIS INSEQUALIS. *Guen.*

Body dull yellowish-white, usually tinged dorsally with pinkish; piliferous spots and spiracles deep brown; head and cervical shield pale yellowish-brown, mottled with deep brown; anal plate unmarked; length 13 mm. Lives on thistle (*Cirsium lanceolatum*) in a silken tube spun beneath a leaf fastened to a branch or to the stem; before pupating they desert their burrows and spin their white cocoons among the leaves. Found many larvæ and pupæ June 17; the moth issued June 28. (G.)

EXARTEMA (ECCOPSIS) PERMUNDANA. *Clem.*

Body green, usually clouded dorsally with dull leaden; first segment brownish; head and cervical shield black or pale brownish; piliferous spots and spiracles concolorous; anal plate unmarked; length 15 mm. Feeds on Siberian crab-apple, tame raspberry, wild blackberry (*Rubus villosus*) and hazel (*Corylus americana*) [and *Spiræa*, Fernald, *teste*, Comstock, Ag. Rep., 1880, p. 268]. Lives in a leaf rolled from the apex to the base, or between two or three leaves fastened together with silken threads. Found a great many May 30; one pupated June 12 and the imago issued June 30. (F.)

LOXATÆNIA (CACÆCIA) CERASIVORANA. *Fitch.*

Body light yellow; piliferous spots, head, cervical shield and anal plate brownish-black; spiracles ringed with pale brown; length 14 mm. Lives on choke-cherry (*Prunus virginiana*) in a nest formed by fastening the terminal leaves together with silken threads. Found a great many in the latter part of June; six moths issued July 7. (F.)

NOTHRIS TRINOTELLA. *Coquillett.*

Body dark purplish-brown, that below the spiracles pale greenish-brown; two broken, indistinct white dorsal lines, and

two similar stigmatal ones, the one below the spiracles the most distinct; piliferous spots black, usually situated on white spots; spiracles black; head and cervical shield yellowish-brown; anal plate unmarked; length 18 mm. Lives in a folded leaf on hazel. One found June 28 pupated July 4 and the imago issued July 21. (The imago was determined generically by Lord Walsingham. I sent a sketch and brief description of it to V. T. Chambers, who wrote me that he was not acquainted with the species and believed it to be new. Accordingly I have given it the above name and send a description with this paper). See PAPILIO, Vol. 3, page 81.

CAPITALIZING SPECIFIC NAMES.

Although Prof. Riley's note in March No. p. 63, is addressed to the Editor, as I must be one of the sinners in his estimation, perhaps I may be allowed the opportunity to say a word in reply, so far as concerns myself particularly. I will repeat the Professor's words and italicise somewhat, so as to bring out the points he makes in this curious note. "Can the editor inform me *upon what grounds* and for *what purpose American lepidopterists have recently adopted the vicious habit of capitalizing the specific names of their insects?* The *tendency* among the entomologists generally has *been in the other direction*, etc. * * * * The prime object of nomenclature *being to facilitate study and thought*, this last fashion has everything in its favor. The capitalizing of specific names is almost as bad and *fully as unnecessary and confusing* as, etc. * * * * If there be any sound defence of the custom I should like to know it."

This reads as if some sort of function attached to the office of Entomologist in Chief at Washington and it were his duty to have an eye to entomological obliquities of all sorts. He wishes to be informed "on what grounds and for what purpose," etc. I hasten, not knowing what may be the next step, to state in defence.

1. The Professor may rest in peace; my "purpose," for one, is not wicked. It is neither nihilistic nor revolutionary, and I hope no cat under the meal or moral dynamite is suspected. I capitalize the names of species because it is the only proper thing to do. If the specific name is that of a person, of course, it is entitled to a capital. I refer the Professor to the next grammar for light. If it is a common noun or an adjective, which is used as a proper noun, it also is entitled to a capital. If John Smith sees fit to give the name "Faith" to one of his daughters, we should not write "Smith miss faith," any more than "Riley professor charles, etc." If John Jones calls his boy "Zealous")

we should not write the name with a small letter because of its being an adjective. *Argynnis* stands for the surname and *Diana* for the christian name. If the name of a person, when applied to a species, is not a proper noun, then it is a common noun, and in most cases could have no meaning; in fact, would be nonsense. If *Diana* in such usage is not the name of the goddess, then it is no word at all, but a chance collection of letters, and we might as well spell it backward and say *Argynnis* anaid.

2. The usage is NOT a recent one. Linnæus uses capital initials for all proper names; also for such names as *Quercus*, *Pini*, *Urticæ*, *Caricæ*; but for such as *crepuscularis*, *ocellata*, not; apparently excluding adjectives.

Fabricius, in usage, follows Linnæus.

Kirby, so late as 1871, Suppl't 1877. and Staudinger, 1871, use capitals for all names. So does Hewitson (*Exotics*); and Felder (*Spec. Lep.*). Westwood (*Drury*) for all names, except adjectives. Boisduval, in *Spec. Gen.*, and *Ind. Meth.* gives capitals for all names; in *Lep. de la Cal.*, adjectives all given with small initials. Harris, *Ins. Inj.*, has proper names in caps., adjectives not, but *semidca* has small initials, though *comma* and *interrogationis* have large, so that I do not discover any fixed rule. The *Ent. Mo. Mag.*, from first to latest volume, for all orders, capitalizes proper names used for species.

The Rules of British Assn. on Nomenclature are silent on this point.

The fact is, the usage which Prof. Riley advocates is the innovation, and so far as relates to names of persons, it is a very recent one, and but partially prevalent. There is no "tendency in that direction." Some persons are always to be found who are ready to jump at any new thing. I could instance several recent entomological fashions. In the present case, some one has started the usage of a small initial letter, and has found his followers. By and by the fashion will set in some other direction, perhaps to old English initials. Who can tell? But many persons do not shift about with every wind.

As to calling the old way "vicious," why may I not as sensibly call the new way "vile?" I do, indeed, detest and abominate it, and when the genus name is also given with a small initial, words cannot express my sense of the iniquity. As to a small initial letter "facilitating study and thought," as if it were a little pill to be taken after meals, that is beyond my comprehension. I may as reasonably say that the use of small letters where they ought not to be, making me mad at the perversity of the editors who use them, distracts my mind and impairs my mental digestion. Therefore, if Prof. Riley would have kind consideration in such cases as mine, and would desire to facilitate study and thought, while avoiding what is "confusing," I beg that he

will henceforth reform his ways and modestly follow the usage of the fathers. W. H. EDWARDS. Coalburgh, W. Va., April 20, 1883.

With the permission of the editor of "PAPILIO" I wish to make a few remarks in reference to the question raised by my friend, Mr. Riley.

Formerly many writers used capital letters for specific names, at least in the case of proper names or adjectives derived from them; but lately the practice has generally been to write every specific name, without exception, with a small letter, and to this rule I am obliged to conform in much of my own work.

Personally, however, I always prefer to commence specific names with a capital letter, and in independent work (such as my Catalogue of Diurnal Lepidoptera, for example) I use capitals for all specific names. It is a matter of convenience, not of principle, although, as regards the latter, a specific name is as much part of the name of the species as the generic name, and equally well entitled to be printed with a capital letter; but in lists of species capital initial letters catch the eye so much more readily than small letters, that I would never advocate the use of the latter. On the other hand, except in columns or series, no specific name should ever stand by itself without, at least, the initial letter of its genus before it. W. F. KIRBY, Zoological Dept. British Museum, April 30, 1883.

Staudinger spells the species with a capital, and it seems to be the practice in England. I am like the old man with the ass in the fable. When I quoted the author of the combinations, like Le Conte and Packard, Prof Riley called my list "immoral." Now, I have a "vicious habit," though I have abandoned the custom first complained of. Mr. W. H. Edwards spells the specific names of the butterflies with a capital. I suppose what holds for the one does for the other. Is there anything else? A. R. GROTE.

ERRATA.

The following sentence in my communication on the capitalizing of specific names (p. 62) was written with the bracket portions and should be so read. "The capitalizing of specific names is almost as bad and fully as unnecessary and confusing as the use of the lower-case letters [for generic names] which has come into vogue among some catalogue[r]s." C. V. RILEY.

A RECENT SOUTH AMERICAN PAPER ON MOTHS.

BY AUG. R. GROTE.

I have received from its author, Sen. Carlos Berg, a pamphlet of fifty-six pages, in large octavo, without plates, entitled "Farrago Lepidopterologica," being a contribution to the study of the fauna of the Argentine Republic. Its perusal has only intensified the feeling I have long had (since studying the Cuban moths) that we need a knowledge of the South American species to get a proper idea of our own. I have shown what a strong Southern admixture there is in our Sphingidæ and in other groups the same or a similar state of things will be found to exist. While some genera (*Catocala*) have not crossed the tropics, *Plusia biloba* is found from Canada to Chili. The mass of equatorial forms are not known to us in the United States to any extent. The collection of the British Museum must be studied. We must depend now largely on Mr. Butler to give us information.

A few points I must discuss with Sen. Berg, chiefly concerning the terminology adopted by him. He uses *Euthisanotia* instead of *Eudryas*. He is wrong in considering *Xanthopastis* as = *Euthisanotia* (*Timais*, etc.) It is a composite genus in the Verzeichniss, containing five ill-assorted species. Hubner takes *timais* and associates it with *Unio* in the *Zutrage*, leaving Boisduval free to erect a genus for *Unio*. Whether *Unio* was published by Hubner before he refigures *Timais*, my notes do not tell me, and I have not the *Zutrage* at this moment. It is of no consequence, because the genus is not adequately founded. *Eudryas* is first properly limited by Packard. It contains three North American species, *Unio*, *Grata* and *Sta. Johannis*. Berg's new species *Platensis* is, if I understand his remark as to the front, no *Eudryas*, perhaps a *Copidryas*. Hubner evidently considered *Timais* and *Unio* as congeneric, and differing from *Xanthopastis*. He associates them, and Boisduval's term must on all accounts be kept for our North American genus. Again, I would like to know how *Megalopyge* is substituted for *Lagoa*. Harris had a perfect right to establish his genus in 1841, because Hubner has two species in *Megalopyge* and if the first (*lanata*) is a *Lagoa*, what is the second (*Nuda*)? Where Hubner has more than one species, the person who separates them has clearly the right to take any. The first is not Hubner's type, by any rule of zoological nomenclature. The "el tipo del genero *Megalopyge*" is an assumption of Sen. Berg's. The right name of the genus is *Lagoa* (= *Pimela*, Clem.). Whatever Abb. and Smith's species are *Crispata* of Packard is distinct and valid. I believe that Abbot's figures may not represent a different species. I have positively identified *opercularis*. My fresh Georgia specimen is in British Museum so labeled. Rubbed Texan specimens may be "*Pyxi-*

difera," but I doubt it. In any event, *Crispata* is not *Opercularis*, which is much darker, mixed with brown and black crinkled hairs on fore wings. *Lanuginosa* may be = *Pyxidifera*, but Clemens' type was rubbed, and rubbed specimens look deceptive in this genus. It is not certain that we have three species, but it is certain that *Crispata* is not *Opercularis*. Again, my *Carama Cretata* from Louisiana, is probably an older name for *C. Walkeri*, Butl. The British Museum specimens determined by Walker as *Sparshallii* were, to my belief, in part, at least, belonging to my *Cretata*, I did not compare them but, on my return, referred my species to *Carama*, of which genus I was unaware when I described my insect. Again, Sen. Berg is probably right as to the derivation of *Halisdota*, but I wrote it as Hubner did, and certainly, "Halesidota," a spelling I corrected, is wrong. By the way, my genus is *Euspseudosoma* not "*Euspseudosoma*," as Sen. Berg has it several times. I am a little surprised that the Cuban is the same as the South American species. The one from Florida appears distinct, but may only be a local modification. I am decidedly of opinion that species showing differences, such as we know sometimes to be specific, as shown by well-marked insects, should not be lost sight of by being united under one species' name. It seems as if now creationists were practically trying to condense the idea of "species," after its being shown that the idea of "species," as formerly entertained, as exclusive, is overstepped in Nature, they get over the facts by calling the so-called "*species Darwinianæ*," "varieties," or "all the same." Varieties are nascent species, undoubtedly, but where the forms are not proved to intergrade in all stages, the distinct names should be allowed to them. It is difficult to draw the line where we only know the perfect stage; it is better to let the names stand in lists till we know all the history, and then we can express the real dependence of the forms more exactly. A certain class of varieties are readily recognized as such, but I am speaking of cases like *Psi* and *Ocidentalis* in the moths, or even *Gentilis* and *Perbellis*. From Sen. Berg's interesting pamphlet I learn that the genus *Metagarista* occurs in South America. I infer that this name is more correct than *Phagarista*. I only know the East Indian *M. Transiens* and our own *M. sevorsa* from Arizona. It is a matter of congratulation that we have so conscientious a Lepidopterist as Sen. Berg in South America. In the matter of nomenclature, however, I would respectfully suggest that I have never taken a name of Hubner's without great care, and I would recommend Sen. Berg not to attempt to displace a well-established generic title upon anything but the surest grounds.

With regard to the vexed question of Hubner's genera I have endeavored to meet the views of those who adopt and those who reject his genera to this extent: 1. Where a Hubnerian genus

has been used by another good authority I have retained it in preference to a later name. Example: *Glæa*, as used by Stephens; *Trigonophora*, as used by Lederer. 2. Where a genus has received a name as previously employed in a different sense by Hubner, I have used the correct Hubnerian designation. Examples: *Lithophane*, *Eustrotia*, *Bombycia*. 3. Where the genus has the same, or nearly the same limitation, with the addition merely of species since Hubner wrote. Examples: *Tolype*, *Habrosyne*, *Anisota*, *Citheronia*, etc. I have only used a Hubnerian name, applied in an indiscriminate manner in the "Verzeichniss," in cases under 2, as above; thus the question of what of a number of species was Hubner's type is much simplified. I have else preferred the later names, such as *Bryophila*, *Taniocampa*, when to restore Hubner's name might cause confusion or lead to dispute. Although a contrary impression may be circulated, it will be found that in my "New Check List," and in the groups of which I have studied the literature and structure, the above limitations will generally cover my use of Hubner. I have "resurrected" none of Hubner's names without long study, and really I don't think I have myself brought a dozen in all into use again. I refer to the preface of my first Check List of the *Noctuidæ* for the argument as to Hubner's genera and the attacks made on them. I see now more closely the importance of keeping a well-known term at the expense of Hubner, but as I have not been extreme in my action, there are but few names for me to retract. If the genera as now adopted by myself are mostly confirmed, as I think they will be, the controversy will be shortened by so much. I have been explicit in this paper without regard to a defense of myself, in order to correct the impression to be gathered from some sources, that every slight structural difference is regarded by me as generic, every color variation as specific, and that I have rehabilitated every generic name in the "Verzeichniss" or "Tentamen." These charges are made by those who do not care to investigate the subject, their object being to rise by criticising others. It would be easy to prove them guilty of what they charge upon me where they have ventured so far into print. In one case the "variety species controversy" is simply used to cover up the real matter of the discussion, as is doubtless well known by all who take an interest in these questions, unfortunately inseparable from the study of Insects.

THE MACHAON CONTROVERSY.

BY H. H. LYMAN.

I have been very much interested in reading Mr. W. H. Edwards' able article in the March number of "PAPILIO," in refutation of Dr. Hagen's theories of the identity of *P. Machaon*

with *P. Oregonia* or *Zolicaon*, and knowing the *penchant* of the learned doctor for simplyfying (?) matters entomological by lumping somewhat similar forms under a single name. I can sympathize with Mr. Edwards' dismay at the idea of the worthy Doctor sitting down to revise the North American butterflies in this fashion. Attention, however, may be daawn to the fact that Mr. Edwards' opinions upon this subject have not always been the same, for in *Butterflies of North America*, Vol. II., part 3, he concludes his description of one of these forms, as follows: *Zolicaon* belongs to the *Machaon* group,, while in his recent article he proves to a demonstration that "*Zolicaon* has no present relations with the *Machaon* group, standing wholly apart from it" and belonging to the *Asterias* group. But my object in writing is not to criticise either of these learned gentlemen, but to describe what I suppose must be a rather remarkable specimen of *Zolicaon* which I possess. This species is represented in my cabinet by two specimens only, ♂ and ♀, which were received from Nevada. The ♂ is of the ordinary type, as figured and described by Mr. Edwards, but the ♀ differs from the type in several particulars.

1. It is very large. In *But. N. A.*, Vol. II, part 9, Mr. Edwards says that a ♀ expanding very nearly four inches is unusual, while my specimen expands 4 1-12 inches.

2. The secondaries above are black at base, more than a third of the cell being of this color.

3. The body has the lateral yellow bands broader than usual and there are three yellow stripes beneath, separating the black into four bands, as in *Oregonia*, only the black stripes are decidedly broader than the yellow ones, and the two middle black bands are united for about half the length of the abdomen.

The pupil in the ocellus is distinct, nearly round above, but rather triangular below. The cell on primaries below is black, with two yellow bars, the inner one dilated towards the median nervure, and otherwise the specimen is normal. I suppose it may be set down as a case of reversion.

REPLY TO DR. HAGEN.

BY A. R. GROTE.

1. In answer to Dr. Hagen I will state that our copy of Hubner's *Exotic Schm.* was bought by Dr. Herrich-Schaeffer who, I understand, had the sale of the work. It is in three volumes. Each volume has a little page upon which alone the name of Hubner stands. If Geyer issued any of the plates there is no evidence of it. The date on the title page is 1806, 1824, therefore, I quoted it. There is no description of the species, only some printed pages of names, as I recollect. Each butterfly or moth is figured in two positions, or male and female. This work is quoted for species by every lepidopterist I ever read. It

is the most magnificent of early iconographs; Boisduval praises it as the finest illustrated work on the subject. Until I know that it is discarded as worthless for synonymy I shall quote it; I shall even quote it in lists as long as I live. The figures are superb, easy to recognize, much better than Dr. Harris' descriptions. Hubner does not give us *S. maculata* as *caroïna*, but recognizes it as distinct under the name of *Celeus*, which I should keep, but *S. maculata* is credited to Haworth and his work is said to be earlier. I have not seen it.

As to the date of *Amyntor*, I supposed (I have not the work now, it is in the Buffalo Society Library) I quoted the the right volume for it; if by any slip I have placed 'II' for 'III,' it might occur in proofs or by my own inadvertence. It is at any rate older than *Quadricornis*. Dr. Hagen is not 'sure;' and this seems to be his state of mind on several lepidopterological matters. The mistake of the number of the volume is not as great as Dr. Hagen's incorrect date of Ochseneimer (see preface to second part of Check List, 1886). But my memory is that the figure in our copy is next to *Chersis*, which Dr. Hagen acknowledges is rightly given as Vol. II. Dr. Harris did not know Hubner's works and described all his species. Hubner is very exact and makes no mistakes, even in our North American Arctias.

With our copy Dr. Herrich-Schaeffer gave some memoranda of dates, from which I took the following note, printed in the Transactions of the American Philosophical Society, 1874, Nov. "The plate of this species (*Luna*), Band 2, Exot. Schm., is wrongly dated "1806" by Dr. Packard. It is later than the "Verzeichniss." In a letter dated September 29, 1866, Dr. Herrich-Schaeffer gave the following dates to [certain plates of] the third volume of the Sammlung; "*Cæsiphon* to *huntera*, 1828; *Asclepias* to *rustica*, 1829; *Io* to *taygete*, 1830; *pasithoe*, *grimmia*, 1831; *crista* to *beltras*, 1832; *nese* to *thirza*, 1833; *deborahylas*, 1834; *lusca-huebneri*, 1835." I have not the memo. now, but as I recollect this date is the latest for any plates of Hubner's Exot. Samml. I have already printed the statement that Dr. Harris referred *Epimenis* to the genus *Brepha*, in pencil, in his extras of his paper in Silliman's Journal, which is thus later than any plates of Hubner. To speak of Hubner's work, as Dr. Hagen has done, it must first be shown that it has been rejected and the species re-named by unanimous consent. The contrary seems to be the case. This is the first I hear that Hubner's species in his beautiful and costly work are to be rejected. But Hubner's European work, as I remember, has not much text. Yet all lepidopterists in Europe adopt his names. To put Dr. Hagen's *ipse dixit* into force would oblige a change in the synonymy too great to contemplate without a shudder and not worth while to save two names of Dr. Harris's. It amounts, practically, to ruling Hubner out altogether, for, though we might keep some of the names, other authors would have to be cited.

CONCLUSION OF LIST OF AMERICAN APATELÆ.

BY A. R. GROTE.

Genus APATELA. Hubn.

Sub-genus *Megacronicta*. Gr.

The type of this section is the well-known *A. Americana*, Harr., which seems to have no European analogue, strictly speaking. The section contains the largest and stoutest species, coming nearest to the section *Acronicta*.

1. A. AMERICANA, *Harris*, Ins. Inj. Veg., p. 317, "American Dagger." This is, on the whole, our stoutest species and its range is Northern; Its identification with the *Accris* or *Hastulifera* of Abbot and Smith is probably illusory. What species Smith intended, or if more than one, can only be ascertained by breeding Georgia specimens and by a careful comparison, in all stages, with the published figures. Gueneé's *Accricola* is a name proposed (after Harris) for *Accris* of Smith, which, in any event, is not the European species of that name. Caterpillar on elm, chestnut, etc.

2. A. DACTYLINA, *Gr*, Proc. Bost. Soc. N. H., XVI., 239 (1874). This species is nearly as stout as the preceding, the color is a bluer-gray, the hind wings in the male whitish, the markings are more continuous, the squamation rougher. In no event can it be a variety of the foregoing. I have seen no description of the larva. "Fingered Dagger." Seems to be Northern in its range.

3. A. INSITA, *Walk.*, C. B. M., 61. This has apparently the hind wings white in either sex. It is much whiter than either of the other two species and had some resemblance to Smith's figures of *Accris*, but any identification of these is clearly premature under the circumstances. The larva is not known. My specimens of the moth were from Massachusetts. I have examined Walker's type. I believe this is his only valid species in the genus.

Sub-genus *Jocheaera* Hubn.The type is the European *A. Alni*.

1. A. FUNERALIS, *G. and R.* Proc. E. S. Phil., 6. 17, pl. 4, fig. 10; Grote Check List, 1875, plate 1, fig. 1 (photo.); *Americana*, Harr., Corr., edit. Scudd., 313, pl. 3, fig. (larva).

Dr. Speyer notes the difference (*Stett. Ent. Zeit.*, 200) between the two species in the moth stage. Lintner describes the larva of the American species which, in this stage, closely resembles the European form with its curious club-shaped body hairs, looking like *Zygæna antennæ*, according to Lederer. Not only is the Mss. name *Americana* preoccupied, but it is *later* in point of publication and should not have appeared at all. The larva of *Funeralis* has been taken on hickory, elm, willow and oak. A detailed comparison of it in this stage with the European *Alni*

would be of great interest. Canada Eastern and Middle States. Considered by some writers our handsomest species of *Apatela*. I prefer *Quadrata* and *Lanceolaria*.

Sub-genus *Merolonche*. Gr., c. f., Ill. Ess.

The type is the Californian *A. Spinea*, and this section, characterized by the peculiarly sunken head and bombyciform appearance, is apparently unrepresented either in the East or in Europe.

1. *A. SPINEA*, Gr., Bull. B. S. N. S., 3, with photo. figure. "Spiny Dagger." The egg and young larva of this Californian species are described by Mr. Henry Edwards in his valuable notes on Pacific Coast Lepidoptera, but the food plant is not stated.

2. *A. LUPINI*, Behr. Mss., Grote, Bull. B. S. N. S., 1, 79. This is a darker species than *Spinea*, the head slightly less retracted; the markings differ in detail. California. "Lupin Dagger." I have seen no description of the larva. I have used for this species a manuscript name attached to my specimens. Neither before or since has it been described by Dr. Behr, so far as I know. As with *Luticoma*, I suppose the authority describing the moth, first, should be alone cited; so far as I can find, this is the view taken by the majority. In future the moth should be called *Lupini*, Gr.

Sub-genus *Lepitoreuma*, Gr.

The type is *A. Hamamelis*, and this group is characterized by the somewhat ovate wings, with slender, short bodies, and raised scales on the wings.

1. *A. OVATA*, Gr., Bull. B. S. N. S., 1, 80, Pl. 2, fig. 14. "Oval Dagger." The larva is unknown to me; the species is not common in New York and Massachusetts. It looks like *Clarencens*, which, I think, belongs to another group.

2. *A. EXILIS*, Gr. A small species which I believe is best placed here and next to *Ovata*. Larva unknown. New York to Texas.

3. *A. HAMAMELIS*, Guen., Noct. 1, 52. Guenée describes the larva on Hazel, but the species has been reared by Coquillett and others on various shrubs and trees. The moth is common and very variable. "Hazel Dagger." Canada to Alabama and Texas. My kind friend, L. W. Goodell, gives a clear description of the larva, on chestnut, *Can. Ent.*, ix., 61.

4. *A. HÆSITATA*, Gr. This is founded upon large, smoothly mixed gray specimens, which may only be a variety of the preceding, but are easily picked out. It is at least a good variety and it must be bred to decide. Pennsylvania. I have seen several specimens since describing it.

5. *A. INCRETA*, Morr.

Looks very much like a small *Hamamelis*, but is, I feel pretty confident, distinct. Massachusetts and New York. The larva is unknown.

6. *A. DISSECTA*, G. and R., Tr., Tr. Am. Ent., S. C., 178, Pl.

1, fig. 81. "Frail Dagger." This is the flimsiest of our *Apatelæ*, and might almost be taken for a *Microscælia*. The markings are like the preceding, but the color is more plainly of an obscure gray. The moth is taken from Canada to Middle States, and Mr. Thaxter has discovered the larva.

Sub-genus *Arctomyscis*, Hubn.

The type is the European *Euphrasie*. We have, apparently, one species in North America belonging to this group.

1. A. SPERATA, Gr., Bull. B. S. N. S., 1, 81, Pl. 2, fig. 1. The hind wings are white in the male sex. The markings are distinct and neat. The larva is not known. Eastern and Middle States.

Sub-genus *Mastiphanes*, Gr.

The type is *A. Xyliniiformis*, and the species are intermediate in shape of wing between the foregoing and *Eulonche Oblinita*. I refer to this section 1, XYLINIFORMIS, Guen. 2. PALLIDICOMA, Gr. (I have seen this wrongly labelled "*Spinigera*," which belongs in reality to *Scnaphora*, and must be a stronger marked insect.) 3. EXTRICATA, Gr. (A large Texan species mistaken for *Xyliniiformis* by Belfrage.) 4. EDOLATA, Gr. 5. LITHOSPILA, Gr. Except No. 2, the species are easily known and generally correctly named in all collections which I have seen. No. 5 looks like a species of *Lithophane* at first sight.

1. A. OBLINITA, A. and S. Mr. Thaxter obtained specimens of this moth in Florida, which were, perhaps, larger and paler, but afforded me no ground for describing our Northern specimens as distinct. The larva is said not to agree, but we must be prepared for variation and even dimorphism in this stage. I think that over so wide a territory there will be some slight variation, and that there is no evidence we have more than one species. Canada to the Gulf.

2. A. LANCEOLARIA, Gr., Proc. Acad. n. s. Phil., 418, 1875. This species is figured in my Illustrated Essay, the abdomen being too darkly colored, as I forgot to tell the artist the specimen was somewhat "greasy." The forewings were, more pointed, the outer median line continuous and angulate compared with *Oblinita*. On the white secondaries there are no discal marks beneath. This is a very distinct species, and, to me, one of the most interesting. "Pointed Dagger." June. Collected by Mr. Thaxter. I have seen several specimens from Massachusetts. The larva, which I would like to know, has not yet been observed.

3. A. INSOLITA, Gr., Bull. B. S. N. S., 1, 82. I have only seen the type. By the shape of the wings and white secondaries it belongs here. Fore wings almost black, with the outer median line written in broad gray lunules. It is a very distinct looking species, but it must be a great rarity. It seems impossible that it could be a variety of either of the foregoing, as it differs very clearly in color and marking. "Rare Dagger." My type was

taken about Philadelphia. The limits of the genus are clearly reached, if not overstepped, with the present section.

Sub-genus APATELA, Hubn.

There now remain a goodly number of species which, perhaps, fall into unnamed sections of the genus, and may, for the most part, be arranged between the group *Megacronycta* and *Lepitoreuma* m. The best marked of these sections is that of which the European *Auricoma* may be considered typical, and to which the term *Apatela* must be specially applied. According to Dr. Speyer's instructive article, the N. Am. *Brumosa* is related to the European *Auricoma*. Guenee does not so regard it, but finds in *Rubricoma*, Guen. and *Luteicoma*, Guen., MSS., species which he found to resemble the European *Auricoma* in their immature stages. I, myself, cannot now compare all these species, but it seems difficult to further divide the American forms into different sections or sub-genera. The larvæ of but few, however, are known, and it is upon the peculiarities of clothing in the larval stage that I would chiefly rely in limiting the sub-genera of *Apatela*. As to this latter term I have fully shown that it must be retained for the genus on grounds of priority. I follow Stephens in this. The term is significant of the curious larval structure in this group which we must call *Bombycoide* of Boisduval, and not *Acronyctadæ* of Harris. The best name for the sub-family group, of which the genus *Apatela* is typical, is certainly APATELINÆ. The Dasychi-riform or Arctiiform larvæ are of great interest and help to bridge over the gulf between the two great families of *Bombycoide* and *Noctuide*.

On the one side the sub-genus *Apatela* resembles *Semaphora* or *Triæna* (the more significant title); on another they seem to run into *Lepitoreuma*. I would add the following to my list of *Triæna* (Papilio, 3, 67):

14. A. QUADRATA, Gr. Bull. B. S. N. S., 2, 154. This, with the next following, is among our finest *Apatelæ*. It is a stout, rather short and wide-winged species, very distinctly marked, the black dashes squared and cut off. "Square Dagger." The species has been raised by Mr. Dodge from the larvæ. Missouri and the Western States.

13. A. RADCLIFFEI, Harvey. The exact position of this fine insect, which has the primaries of a peculiar pearly gray, and the hind wings whitish in the male, is doubtful. It seems allied to the species I have described from Texas under the name of *Tota*. The larva is not known, and perhaps this and the next are better placed in the section *Acronycta*. Eastern and Middle States. "Radcliffe's Dagger."

16. A. INNOTATA, Guen., Noct. 1, 50. *Graefii*, Gr., Proc. E. S., Phil. 2, 68, pl. 3, fig. 6. This species varies in color, some specimens being of a clearer, light fawn-yellow, others more grey and clouded. It is curious to see how the lines copy the course

in *Diphthera Fallax*. A highly colored *Innotata* does not look unlike a *Fallax* which has lost its green color and turned yellow. "Graef's Dagger." The larva is apparently not described; it will be curious to note its relation to that of *D. Fallax*. Canada to Middle States; rare about Brooklyn, in the then suburbs of which the type of my *Graefii* was taken rather more than twenty years ago. I venture to keep the name in the English equivalent. We used to consider this a very rare and interesting insect.

I will now enumerate the species referable to the typical group of the genus "*Apatela*" in a restricted sense, a group which is represented in Europe by *A. Auricoma*, and in North America by *A. Brumosa* more especially, as held by Speyer, though Guenée disagrees. I think that the species clustering about *A. Separans* may afford another division, and by no means consider the group as homogenous. We must know the immature stages before deciding. In *Triæna* itself, which is a more easily defined group, I am uncertain whether *Occidentalis*, *Lobellie*, *Hæsta*, *Quadrata*, etc., should not be separated from *Albarufa*, *Falcula*, etc., to say nothing of single species of difficult affinities, such as *Vinnula*. The species of *Apatela* proper are: 1. BRUMOSA, Guen., 2; DISTANS, Gr., 3; RUBRICOMA, Guen., 4; LUTEICOMA, Guen., Mss. (this name was given us by Mr. Guenée with that of *Agrotis Repentis*, names not published in the Species General, but attached subsequently to types in M. Guenée's collection, and under which we illustrated the species—there were three such names given us by M. Guenée to my collection, but the third I no longer remember); 5, SUBOCHREA, Gr. (a fine insect taken about Buffalo—"Bright Dagger"—in no way related to Mr. Morrison's *Aspera*, which is a Hadenoid form, probably belonging to *Polia*); 6, CONNECTA, Gr.; 7, PERDITA, Gr.; 10, AFLICTA, Gr.; 11, NOCTIVAGA, Gr. To these 11 may be added 12, HARVEYANA, Gr., and 13, CLARESCENS, Guen., which resemble *Triæna* in some respects and, perhaps, do not belong here. I do not know what the larvæ are like.

To recapitulate this list of our *Apatelæ*, and following in the main my arrangement in the new check list, the following are the approximate figures. There are about eighteen European species known;

Name of Sub-genus.	No of Species.	Name of Sub-genus.	No. of Species.
<i>Triæna</i>	16	<i>Lepitoreuma</i>	6
<i>Acronicta</i>	4	<i>Arctomyzicis</i>	1
<i>Megacronycta</i>	3	<i>Mastiphanes</i>	5
<i>Merolonche</i>	2	<i>Eulonche</i>	3
<i>Focheera</i>	1		
<i>Apatela</i>	13	Total number of species.....	54

As near as may be we have three times as many species of *Apatela* in North America as in Europe. The genus is northern

in distribution, yet in Texas and Arizona are a number of fine species. The geographical range of genera seems wider in North America where we find *Fidonia Fimetaria* in Texas, whereas in Europe the genus does not extend so far south. As in the butterflies the lower grade of Noctuidæ (*Catocalinæ*) are much more numerous in America, but there is no parallel in the Noctuidæ to the preponderance in Europe of groups of butterflies like the brown or meadow butterflies. In typical genera or leading genera we outnumber Europe from two to three times in species, *i. e.*, *Agrotis*, *Hadena*, *Catocala*, etc. We are weak in *Cucullia* (though we seem to have most of the groups), and, in the smaller geometrid-like Noctuids, such as *Thalpocharis*, *Eustrotia*. Our *Plusias* are more bizarre, but on the whole less rich and fewer compared with Europe, but here the Asiatic species intrude. I think we may safely assume double the number of species in North America, as compared with Europe, in the *Noctuidæ*. Elsewhere I have objected to the including of the Labrador fauna in European catalogues and pointed out that its affinity was with the New England fauna of which it is an extension. The Arctic forms of Labrador are found in suitable elevation within the limits of the New England States. To return finally to *Apatela*, the following names I have not identified, and the discovery of the species intended will disturb our synonymy somewhat. I think that Guenée has been unusually brief and unsatisfactory in his descriptions in this most interesting of genera, and which affords, like *Heliophila*, one of the most fascinating studies in the sub-order.

A. Spinigera, Guen., Noct., 1, 45.

A. Telum, Guen., Noct., 1, 45.

A. Interrupta, Guen., id., 46.

A. Longa, Guen., id., 54.

A. Ulmi, Harr. Ent. Cor. 312, Pl. 3, fig. 10. (*Larva*.)

A. Pruni, Harr. Ent. Cor. 313, Pl. 4, fig. 13. (*Larva*.)

A. Salicis, Harr. Ent. Cor., 314, fig. 44. (*Larva*.)

A. Aceris, Abb. and Sm., 2, 93. (*Imago and larva*.)

A. Hastulifera, Abb. and Sm., 2, 92. (*Imago and larva*.)

Mr. Walker's synonyms are noticed in my Illustrated Essay.

If we could only make out these nine species *satisfactorily*, the nomenclature of our species might be considered to be well ascertained. Of two or three of them I have suspicions, but no sufficient certainty.

The main part of the interest in the species of *Apatela* must always lie in the collection of the larvæ. These are gaily colored and diversely ornamented, so much so that they offer generic characters, while the sober gray moths they produce are, on the whole, uniform and uninteresting in appearance. The characters of the genus are not strong; they have to take in so heavy a moth as *A. Americana*, and so slight a one as *A. Vinnula*; so

compact a species as *Spinea* and so frail a one as *Dissecta*. I hope the present List will create fresh interest in the matter. As compared with its representation in Europe, the genus has taken on much new character, and its diagnosis may need rewriting. I would not be understood as giving anything but the most superficial value to the sub-genera I have here recognized; they have been merely helps to sort and arrange the species and light up the genus a little from within, so that we can see where the main differences between European and North American *Apatelæ* lies.

MID-WINTER BUTTERFLIES.

BY W. G. WRIGHT.

A three hundred mile trip was made into Lower California this past winter, starting January 18, 1883. The expedition consisted of a botanist, a conchologist, an ichthyologist and a lepidopterist, and the report of this latter is herewith given. If one cannot expect very great results at this season of the year there will be this negative advantage, that the story will be brief.

The climate of this region is so mild, equable and dry that not one of the party took overcoat, umbrella or rubber blanket. Usually we went about without coats on. One day in particular was very hot; I think the mercury must have been up to 90°. A canvas covered wagon and a small tent sheltered the party at night. It was known to us as a barren country, and especially so, since no grass had as yet started, so, as forage is not kept there for sale, we were obliged to carry hay and grain for our teams, enough to last the entire round trip, from San Diego. Water for camp use is found at springs and wells. Wherever a spring is found, there is sure to be a Mexican family living. But these improvident people never have anything to sell, and when a stranger ventures into one of the houses his first impulse is to get out again as speedily as possible, unless, indeed, he be an insect hunter. Wood for camp fires was usually abundant. Only once did we fail to have a roaring good fire nearly all night, and water for camp purposes was never lacking but once; but as for brooks and running streams, there were none. During 200 miles of the Southern part of the trip not one running stream was found. It had, however, been a dry winter, no rains having fallen up to that time., consequently the whole interior was dry and barren. During the first few days we crossed a series of high, cold hills. One of the nights there was very cold, and a skim of ice was found in the morning; then the road led down to the coast, and soon we felt the damp, mild sea air, and found warmer weather, and a little green grass and blossoming plants, and a few butterflies, and, as we worked southward along the shore we met ever-

increasing numbers of flowers and flying things, and still lovelier weather.

At one place we found an American family who had been apprised of our coming. The young lady of the rancho had found for me a few large cocoons about the size of hens' eggs. Some of them were found on the evergreen pepper tree, *Schinus molle*, others on the cultivated almond, and on southernwood, *Artemisia*. I hunted the pepper tree over again, and found one more cocoon. But what they were I shall never know, for they did not live to emerge.

Flying about a gorgeously flowering *Lantana* bush I found a few butterflies, and at dusk also a good many small moths. Here also were beds of *Mignonette* in blossom, *Nasturtium*, *Geranium*, and banana, strawberry and almond flowers, but none of them had butterflies. A few days afterward I found some half-grown larvæ on a *Pentstemon*, and also the same kind on a wild rose bush, both plants being in leaf. Some of these larvæ I brought home with me, fed them to maturity, and got *Melitæa Chalcædon*. The larvæ of this butterfly must hibernate when half grown. On the sandy beach, and just above high tide were composite plants in blossom and there I took several butterflies. Near by and sheltered from the sea by sand dunes, I found a series of *Lycænas* on the salt grass, especially *L. Exilis*.

One day we went to explore a warm canyon that was so sheltered from the chill ocean breeze as to be more forward in vegetation than any other place. Here I got several Spring *Lycænas*, also *Lemonias Virgulti*, and *Colias Harfordi*. And on a steep, sunny slope, I found one *Charis Nemesis* on a composite flower.

Many other canyons, plains and hills, were ransacked, but the narration would be tedious. But I must not omit *Lycæna Sonorensis*. During the whole trip this delicate butterfly was seen only at one place, a dry mesa or beach, close by the shore, and shut in by some circling cliff, like hills. There, in a little potrero or basin, and almost in the mist of the thundering surf, there were hundreds of them. As one was caught, one or more others were sure to be seen. The ground was in good part covered with impenetrable clumps of cactus, and between and among the bunches of cactus grew the plant of these little butterflies, *Erodium cicutarium*, upon which the females were depositing their eggs. I thought it rather singular that this most tender of all butterflies should be breeding at this season, and directly in the breath of the ocean.

While busily engaged in taking a supply of these beauties, I attracted the attention of three young Indian boys, ten or twelve years old, and they came down to see what I was doing. They wore no hats, no shoes, no clothing. One had a string around his waist; the second had added to his string a narrow strip of

cloth between his legs and tied before and behind to the string, while the third had neither ribbon or string. Their faces were broad, coarse, and brutal; their heads large, and covered by a fearful mat of hair, while the skin of their bodies, naturally dark brown, was almost black from continual exposure. And they gazed in dumb amazement at me, as I caught the little silvery-blue gems. At length, getting the idea, they began to try to help me. They chased about nimbly among the sharp cactus spines to catch the butterflies in their hands, and really did so catch several, and offered them to me, but I refused them, and made the little rascals stop crushing the tiny things in their great paws. These boys had their bows and arrows, which they did not lay down. The bows were of oak sapling, very roughly made, and the arrows were straight splints of wood, illy pointed, not poisoned, and spirally feathered with some care, the wings being gummed to the shaft with the pitch of the pitaya cactus, and the string of the bow was home-made from fibres of the agave. One offered to sell his bows and arrows for "dos réal," (25 cents.) They called butterflies "palometer," and sphinges "mariposa." They said that their house was on the cliff, and I went up there with them to see in what state they lived. It was an open place between the larger rocks, just like a sheep pen, and all the house there was consisted in a little brush thrown in, fence-like, only that and nothing more. No roof, no shelter at all, no fire-place except three stones. And lounging about were thirty or forty adult Indian savages, playing with Spanish cards, or gambling with sticks, or dozing. From appearances, they had lived there a long time. After watching their doings for a long while, I turned to go away, and came within an inch of stepping upon a squaw who was curled up in a little hole or hollow, asleep. She started up in alarm, and in silence sat and stared at me with her great black eyes, and, for all I know, she is gazing yet.

Following is a list of species observed, except the *Heterocera*, which are not yet determined:

Pieris Occidentalis,
Sisymbrii,
Anthocharis Sara,
Cethura,
Colias Harfordii,
Ariadne,
Danaüs Archippus,
Berenice,
Vanessa Antiopa,
Pyramis Huntera,
Cardin,
Carye,

Funonia Cœnia,
Lemonias Virgulti,
Charis Nemesis,
Lycœna Antiacis,
Sonorensis,
Piasus,
Amyntula,
Exilis,
Phyciodes Mylittæ,
Pyrgus tessellata,
Thanaos Tristis.

Obituary.

PROF. P. C. ZELLER.

The death of this veteran lepidopterist has occurred, long expected and deeply regretted. Seven years younger than the century itself, Prof. Zeller was born on the 9th of April, 1808. Professor in the Prussian Real Schule at Meseritz, he was finally retired on a Government pension, and has lived since 1870 near Stettin, continuing his entomological labors in connection with the Entomological Society of Stettin. Commencing to write at an early age, Professor Zeller has grown up with the modern science of lepidopterology. His earliest studies were upon the collections of Frau Lienig and the material brought by himself from a Southern trip, which extended as far as Sicily. Zeller discovered the curious diurnal *Rhodocera Farinosa*, besides describing certain *Lycænidae*, but his principal attention was given to the small moths of the families *Pyralidae* to *Tineidae*, the modern classification of which he may be said to have founded. He first cleared up the confusion as to the genera of *Phycidae* and by using natural characters, chiefly secondary sexual ones, he succeeded in disentangling our minds with regard to the order of nature in this obscure and neglected field of inquiry. His species and genera are very numerous and almost always valid. It is a misfortune that his valuable monograph on the *Crambidae* was issued so nearly simultaneously with the worthless writings of Francis Walker on the same subject, so that some of our North American material has been twice named. The evidence seems to be that Zeller's paper may have been earlier. As a matter of justice it should have priority. In a series of articles, published since retirement from official duties, Prof. Zeller described a number of moths from North America. Rather more than the, unfortunately not to be avoided, proportion of synonyms mark the papers, which are otherwise models of what descriptive work ought to be. Still later, Professor Zeller has published a beautifully illustrated volume on microlepidoptera and has given a classification of *Chilo*. As I remember him, in 1867, Prof. Zeller was a white-haired gentleman of very kind manners and enthusiastic for his favorite science. He was moderately thin and tall, wearing a slight whisker, but otherwise with clean shaven mouth and face. His nose was large and well-shapen, his eyes bright and the whole expression of his face pleasing. He had high cheek bones and his countenance was unmistakably German in its salient features. Loew, the celebrated dipterist, was then living in Meseritz, and an entomological excursion which I made with these two celebrities is among the most pleasant of my

European reminiscences. Prof. Zeller's home relations were of the happiest, and the sympathy of an amiable and considerate wife was his through life. And it was a life devoted to science and learning. His accomplishments as a linguist and teacher were well known and appreciated in Germany. We know him chiefly as a biologist, the describer of the exterior structure of lepidoptera. He was fortunate enough to avoid much of the controversial spirit which accompanies descriptive entomology. Although he felt deeply the uselessness of the British Museum Lists and his own studies were impeded thereby, he has, on the whole, little to say in criticism of others. He was not only charitable, but had schooled all natural irritability. His assistance was freely given to others, and Mr. Stainton's work on the *Tineina* acknowledges its value. He was a type of a kindly German pedagogue and naturalist which hardly exists elsewhere. A. R. G.

BOOK NOTICES.

AN EXCELLENT BOOK.

We have received from the publishers, Messrs J. B. Lippincott & Co., of Philadelphia, a beautifully printed volume of 436 pages, illustrated with 440 wood cuts, entitled "Insects Injurious to Fruits," by William Saunders, the well known editor of the *Canadian Entomologist*. A careful entomologist, an experienced agriculturist, an able chemist, Mr. Saunders unites the qualities necessary to produce a valuable work on Economic Entomology and, in fact, the volume before us is, without any doubt, the most able contribution to a knowledge of its subject in the English language. We say this with an acquaintance of what has been published both in England and America upon this subject. In addition to its practical and scientific value, which should recommend it to every orchardist and entomologist in America, it is written in a particularly clear and unaffected manner, so that the information it contains is readily assimilated by the reader. The illustrations are superior to anything yet published in this style. While many of these have appeared in Government or State Reports, many are original and these are better than any we have yet seen. Take, for instance, fig. 173 (*Apatela*) or fig. 208 (*Dynastes*), these figures seem the perfection of drawing. The arrangement of the contents is very convenient. The different fruit trees and plants are treated in turn with the species injurious to each and the remedies following. Sixty-four numbers alone are given to the apple, which attracts so many injurious insects that an old apple orchard is a place of infection for a wide dis-

tract. There is a good index and a list of the scientific names used, at the end of the book, which is an important matter to a work of this kind and, in saying that Mr. Saunders has ably performed a tedious but much needed task, we feel that we are simply just without being at all generous. Considering the quantity and quality of this class of work it may be thought difficult to produce a striking addition to our literature of the subject, but Mr. Saunders has succeeded in doing this and since the publication of the late Dr. Harris's Treatise on Insects Injurious to Vegetation, which has become a classic, nothing has appeared so useful and readable, so free from objectionable and useless matter, in such equally good taste as Mr. Saunders' volume on Insects Injurious to Fruit. The book will find its way, undoubtedly, into many hands and will add to the solid esteem in which its author is held by all who have benefited by his scientific labors or his personal friendship. Mr. Saunders' book is like himself, good, solid, sincere and useful, utterly devoid of humbug and clap-trap, deserving of the commendation of every conscientious thinker and worker the world over. A. R. GROTE.

A NEW PRINCIPLE IN PROTECTION FROM INSECT ATTACK.

Under this caption Prof. J. A. Lintner claims originality for the idea that by deodorizing plants they will be saved from being the depositories of the eggs of insects. The pamphlet is nicely written, but contains no details of experiments to justify the author's claim, the originality of which seems unimportant in the face of the fact that practically that is what is effected by the use of many remedies against injurious insects. The pamphlet is occupied by an *ex parte* argument as to the sense of smell in insects, of which no one has publicly, we think, denied the existence. It is certainly not to sight that moths owe the finding of plants in the darkness on which to oviposit. What is needed in the use of preventatives just now is *systematic action* and *co-operation*. The labor of one farmer is neutralized by the idleness of his neighbor and injurious insects are harbored next door to where they are constantly being driven out. The remedy is the education of the rising generation. If, in the common schools throughout the country districts, practical entomology were taught in a simple elementary manner we should soon see a different state of affairs, then the young farmers would probably take the nests of the apple tree tent caterpillar in time, instead of those of the robin, and we should have more birds and less noxious insects. Professor Lintner's pamphlet is an addition to the theoretical discussion of Economic Entomology and will no doubt be read with interest in certain quarters.

A. R. GROTE.

NOTES ON LEPIDOPTERA.

MELITÆA CHALCEDON is the largest of its genus in California, ranging from $1\frac{1}{2}$ to $2\frac{3}{8}$ inches in expanse. It is rather variable in its markings, especially on the primaries, where the spots vary from white to yellow, and run into each other and play at hide and seek with the red ones; but it is always very gay and handsome in its coat of black and red and yellow. Occasionally, also, marked cases of suffusion are found, where the fore wings are wholly suffused with a beautiful crimson, which obliterates the light markings. The eggs are light yellow, nearly globular, and very small, considering the size of the butterfly. They are carelessly laid on the upper or under side of the leaves, indifferently. In confinement they are as freely deposited on the gauze bag as upon the plant. The larvæ are spiny and woolly; rather restless in habit, moving about a good deal, and are free feeders, eating various scrophulaceous plants, also a wild rose, but are oftenest found on *Scrophularia Californica*, a perennial herb, and on *Pentstemon antirrhinoides*, a deciduous bush. In Mexico I have found the larvæ feeding in January, but in California they do not appear till April, and the butterfly is on the wing early in May. W. G. WRIGHT.

HADENELLA. n. g. Small, allied in form to *Oncocnemis Gracillima*. Front with a central navel-shaped or sub-cordate tubercle. Labial palpi short; third joint very small, hardly exceeding the infra-clypeal plate. Tongue moderate. Eyes naked, unlashd. Tibiæ unarmed. Abdomen smooth, a minute tuft at base. Vestiture scaly. Thorax thickly squamous behind. Antennæ simple.

HADENELLA PERGENTILIS. n. s. Resembles *Hadena Cylindrica*. Gray, shaded with fawn or ochrey. Orbicular oblique, pale ringed, with dark center. Reniform transverse, blackish. Claviform indicated, like orbicular. Lines obsolete. A black costal mark before the fawn-colored apical region. Terminal space with a rufous central shade, marked with blackish at internal angle. Veins dotted. Fringes gray and pale, lined at base. Hind wings pale fuscous. Washington Territory. At Mr. Neumægen's request, I described this little species before giving him the *Noctuidæ* of my late collections.—A. R. GROTE.

HIBERNATING BUTTERFLIES. The spring has been very backward, judging from the condition of vegetation. To-day (May 8) I noticed a comparatively fresh specimen of the Camberwell Beauty, certainly a hibernated example, on the flowers of the Kentucky currant. I have observed this butterfly (*Vanessa Antiopa*) hibernating on Staten Island many years. Wintered examples have the veins denuded on the brown field of the wings. A. R. GROTE.

GRAPTA AND CALEPHELIS. I have shown that there was a botanical genus *Polygonum* when Hubner described *Polygonia* and that, therefore, Kirby's term *Grapta* should be retained for the lepidopterous genus. As to the Erycinid genus *Calephelis*, this is not a pseudogenus, based on illusory comparative characters, as are many of Mr. Scudder's, but *Borealis* and *Caenis* differ from *Nymphidia* by the hairy eyes. *Callicista*, Gr., is one of these bastard genera, which have only a sectional signification if we base, as we must, our genera upon natural characters. A. R. GROTE.

THECLA LÆTA. In the woods, near my house, to-day I took a ♀ *T. læta*, the second example I have taken here in eighteen years. *Lyc. vio:acea* was abundant. W. H. EDWARDS, Coalburgh, April 17, 1883.

CURIOUS VARIETY OF TELEA POLYPHEMUS. On the 16th of June I captured at Fort Lee, on the Hudson, a very singular specimen of this insect, which deserves a permanent record. It was wholly of a pale ochreous tint, smaller than the usual size, and with no appearance whatever of the transparent vitreous spots, so characteristic of the species. The bluish lunules of the secondaries are much narrower than usual, and the yellow spot which generally encloses the transparent space is reduced to a small ovate opaque patch. The specimen is a male, and was at rest on an oak tree, having just emerged from the chrysalis. CARRIE M. EDWARDS, New York, June 25, 1883.

WHILE these sheets are passing through the press, we have, with infinite sorrow, to record the death of our friend and fellow worker, Dr. JAS. S. BAILEY, of Albany, which took place on the 1st of July. A memoir of his life and writings will appear in the September number of this journal.

PAPILIO.

Organ of the New York Entomological Club.

Vol. III.]

SEPT.—DEC., 1883.

[No. 7-10.

ON THE TRANSFORMATIONS OF SOME SPECIES OF LEPIDOPTERA.

By HENRY EDWARDS and S. LOWELL ELLIOT.

It is desired in the present paper to give some few facts with reference to the early stages of well known insects, and to call attention to the food plants of many not hitherto recorded. It is hoped that, while following a beaten track in many instances, some new ground may yet be covered, and that the record of observation now given may not be without its value. The numbers following the name refer to the species in Mr. Elliot's breeding boxes.

SPHINGIDÆ.

HEMARIS UNIFORMIS. G. and R. (No. 51.)

Larva. (After 3d moult.)

Head rather small, bluish green, with white irrorations; 2d segment with yellow ring in front. The dorsal region is greenish white with darker median stripe. Below this is a lateral yellow line running to the caudal horn, and becoming wider as it approaches its base. The lateral space below this line is yellowish green, covered with yellow irrorations. The spiracles are red in the centre, with a white dot above and below. On the anal segment is an oblique yellow dash. The abdominal legs are yellowish at their base, banded with black, and with the tips pink. The thoracic feet are black at the base, then a narrow white band, and pink at their tips. Mouth parts black. Caudal horn rough, pinkish on the sides, blue green in centre and beneath, with raised black irrorations.

Length, 1.50 inch.

Food plants. *Viburnum opulus* and *V. dentatum*.

Larva (Full grown.)

The dorsal line after the last moult has become a crimson broken

band, edged and shaded with white. The blotches around the spiracles are more distinct—the spiracles themselves are black in the centre, with a clear white spot above and below. The underside has a crimson line along the anterior and posterior portion, and sometimes a crimson transverse line in the middle between the abdom. legs and thoracic feet.

Pupa. Pitchy brown, elongate, head parts much produced, and flattened about the wing cases. The segments are roughened on the anterior, rather smooth on the posterior portion. Cremaster rough, thick, and long.

Length, 1.50 inch.

Two specimens of the larva have the 2d segment somewhat raised, roughened, with small tubercles, reddish orange. The spiracles are bright crimson, surrounded with a crimson ring or blotch. Caudal horn also crimson.

DARAPSA CHOERILUS. *Cram.* (No. 70.)

Larva. (Full grown.)

Head very small, as in all the genus, pale yellow green, with darker median line; 2d segment, yellow green, with numerous irrorations. The spiracles in this segment are all orange in centre, pale yellow above and below. In the other segments they are orange, white above and below. Segments 3, 4, and 5 are also pale yellow green—the two latter swollen into a hump. The remaining segments are all bluish green, covered with white dots, and with a slightly darker dorsal line. On 5, 6, 7 and 8 are oblique whitish bands; but on the posterior segments these are lost in a continuous line to the base of the caudal horn, which is bluish at the base, pale green at the tip, and white in the centre. The anal segment is yellow green, as also are the abdominal legs. The thoracic feet are green, with the sides orange red.

Previous to change, the caterpillar assumes a purplish leaden hue, the dorsal and lateral lines becoming blackish.

One specimen is pinkish, with the 4 anterior and the anal segment of a brownish cast, and with a dark dorsal stripe. The lateral line is also brown.

The differences between *D. Myron* and *D. Choerilus* are that in the former the whitish oblique stripes are interrupted by the lateral line, which forms a straight edge at the junction of the oblique lines. There is also a distinct white lateral line along the anterior segments, 2, 3, 4, and 5, which is wholly wanting in *D. Choerilus*. *D. Myron* has also a row of sub-ovate dorsal spots on the anterior portion of each segment. The color of *D. Myron* varies exceedingly, green, cream-color, purplish brown, deep brown and lead color being found.

Food plants. *Viburnum opulus*. *V. dentatum*.

Pupa. Purplish brown, with pink tint over the whole surface, slightly mottled. Wing cases also mottled with black. Spaces between the segments pitchy brown. Spiracles large, well marked, deep brown.

CRESSONIA JUGLANDIS. A. & S. (No. 50.)

Young Larva.

Very pale yellowish green, the body entirely covered with pale yellow irrorations, regularly placed, about 5 rows to each annulus. Head truncate in front, conical, the apex of the cone being furnished with 2 chestnut brown roughish spinous processes, from which along the sides of the head, arise 2 narrow yellowish streaks. The lateral streaks are narrow and very indistinct. The caudal horn is rough, pinkish at the base, with some very minute black points upon the surface.

On hickory. (*Carya alba* L.)

SPHINX CHERSIS. *Hubn.* (No. 42.)*Larva.* (Full grown.)

Pale blue green, whiter on the dorsum. Head and 3 following segments of a darker tint. The head, which is rather small for the size of the larva, has 2 oblique yellowish white stripes in front. The usual oblique stripes of the body are clear white, edged in front with a blue green shade. They are rather broad. The anal segment is truncate, wholly yellowish green. Caudal horn bluish, black at the extreme tip. Spiracles black in centre, with a white circle. Feet and mouth parts pinkish brown.

Abdominal legs, blue green.

Length, 3.75 inch.

Food plant. *Syringa persica*.

BOMBYCIDÆ.

PHRAGMATOBIA RUBRICOSA *Harr.* (No. 18.)*Larva.* (Full grown.)

Head moderate jet black, shining. Body slate color, with pale yellowish dorsal and lateral lines, the space between them being closely covered with black waved lines, formed of transverse specks. The spiracles are clear white, with black ring, and below them is a broad waved yellowish line. Each segment is furnished with 8 tubercles, from which spring bunches of bright chestnut spines. Under side slate color. Feet black. Abdominal legs pale testaceous. Some examples have the ground color a little darker, with the spines much lighter in shade. This may be a sexual character.

Length, 1.30 inch.

Cocoon. Very thin, and lace-like, oval, and very regular in outline, attached to the under side of the leaf. Clearly shows the pupa within.

Pupa. Short, pitchy black, shining, slightly constricted at the base of the wing covers, and swollen at the middle of the abdomen. The

segments beneath are paler posteriorly. Anal segment chestnut in the centre.

Length, 0.75 inch.

The caterpillar when disturbed falls to the ground, concealing itself at the base of its food plant, and the moth has much of the same habit, feigning death and hiding in the grass and other herbage. The food plants, so far as observed, are *Solidago*, *Eupatorium*, and *Symplocarpus* (Skunk cabbage.)

DEIOPEIA BELLA. L.

Larva. (Full grown.)

Head chestnut brown, smooth, shining. Ground color of body deep buff, without orange tint. Each segment has a black transverse mark deeply notched before and behind, and edged broadly with white, bearing rather long hairs, those of the dorsal region black, of the lateral white. The mouth parts are white. The abdominal legs orange, banded with black and white. The thoracic legs wholly black.

Length, 30 mm.

Food plants, *Prunus*, *Lespedeza*, *Ulmus*, *Myrica*, as well as the pods of *Crotalaria*.

PARASA CHLORIS. H. S. (No. 56.)

Larva. (Full grown.)

Dorsal region white, with 3 stripes of bright purple, slightly waved and contracted at base by the large conical processes, 6 of which (3 on each side) spring from the sides of the dorsum, which are elevated into a sharp ridge. The color of these processes is bright orange red, and they are covered with rather long yellow hairs. The spaces between them are also orange red, and bear two smaller tubercles with yellow spines. Below these is a double row of purple lines, enclosing a series of small orange red tubercles, and on the lower lateral region is another row of spinous tubercles of the same color. The under side is wholly dull purplish brown.

Length, 0.9c inch; width, 0.30 inch.

Food plants, wild cherry, *Myrica*, *Ulmus*, etc.

LIMACODES SCAPHA. Harris. (No. 53.)

Larva. (Full grown.)

Ground color pale apple green. The segments are extended laterally in the middle of the body, and raised into an elevated ridge, sharp and angular at the edges. The flattened portion which includes the dorsal region is chestnut brown, darker on the margins. There is also a darker dorsal stripe. The segments are arranged like the plates of a tortoise. The lateral region is a pale yellowish green, with oval white spot on 9 and 10 segment. Spiracles pale brown; mouth

parts also brown. In some specimens the brown color of the dorsum is reduced to small patches, and occasionally a yellow dorsal line is present, the ground color (pale green) then prevailing.

Length, 0.85 inch; width, 0.25 inch.

Food plant. Wild cherry.

Before undergoing its change to *pupa*, the caterpillar becomes creamy white, and loses the brown marks of the dorsum. The underside of the body is more yellow, and the green color only faintly retained about the head and the 2nd segment.

ADONETA SPINULOIDES. H. S. (No. 67.)

Larva. (Full grown.)

Whole lateral region bright apple green. The dorsal is chestnut brown, narrow on 2d segment, widened on 3d, and still wider on 4, 5, and 6. The 7th is yellowish green, thus breaking the line of the chestnut color. On 8 the brown markings again widen out, extending over 9, and narrowing on 10 and 11. On the sides of the dorsum is a row of orange red tubercles—11 on each side—bearing very short spines, those of the posterior segments being the largest. There is also a series of non-spinous tubercles above the spiracles.

Length, 0.40 inch.

Food plant. Wild cherry.

GLUPHISIA TRILINEATA. Pack. (No. 41.)

Larva. (Full grown.)

Very bright apple green. Head of a bluer shade, with 2 minute black dots at the junction of the 2d segment. On the dorsum for the whole length of the body are two rather broad, even, yellow stripes. Spiracles very minute; whitish green.

Length, 0.65 inch.

On willows.

NOTODONTA STRAGULA. Gr. (No. 85.)

Larva. (Full grown.)

Head slate color, mottled with black, and with pale stripe on each side. Mouth parts with a greenish tinge. Body pale lilac, with the exception of the 11th and 12th segments, which are dull golden. The 7th and 8th have raised prominences, which are also golden, that of the 7th being the largest. Laterally there are some pale oblique streaks somewhat similar to those of many *sphinxidæ*. These do not meet on the dorsum, where there is a faint slate-colored line. Between the 2d and 6th segments, and common to all of these, is a darker dorsal shade which re-appears on the 11th and 12th. The spiracles are white, with a black ring, and the lower lateral line is paler than the rest of the

body. The 12th segment bears a hump, and the sides of 11, 12, and 13 are pale brown, mottled with orange. Abdominal legs dull slate-color, mottled with black; thoracic legs black.

Length, 55 mm.

Food plant. Willows.

OEDEMASIA CONCINNA. A. & S. (No. 47.)

Larva. (After 2d moult.)

Body bright yellow; head jet black; 2d segment with a jet black transverse mark. Each of the other segments has a transverse row of 8 or 10 minute black points, those of the dorsal region being the largest. Between these are a few whitish hairs. Anal segment and thoracic feet pitchy; abdominal legs concolorous.

(Full grown.)

Head coral red, as is also the 4th segment, which is raised into a hump. The dorsal and anal regions are a dull yellow, with black waved lines; the sub-dorsal white, with waved black lines. Lower lateral yellow, with waved black lines. All the segments bear 6 or 8 piliferous black tubercles, looking like black sealing wax. Anal segment jet black. The hairs are all sordid white. Underside dull yellow, streaked with black waved lines. Abdominal legs yellowish flesh color. Thoracic feet black.

Length, 30 mm.

Food plant. Willows.

CERURA CINEREA. *Walk.* (No. 52.)

Larva. (Full grown.)

Pale apple-green; head brown; 2d and 3d segment also with brown triangular patch, not united to the brown dorsal patch. On the 2d segment are two raised rough processes, like horns, brown in color. Commencing on the 4th, and continuing to the anal segment, is a brown patch, as in other members of the genus—a mere point on 4, spreading out diagonally on 6 and 7, narrowing on 8, a little wider on 9, narrowing again on 10, and wider on 11 and 12. The anal segment is furnished with long filaments alternately brown and green. The lateral green spaces have a number of rather small reddish spots, and on the dorsal brown patch are some small roughened tubercles.

Length, 1.30 inch.

Food plant. Willows.

The younger stages are of a paler color in all parts, without any perceptible difference in the markings.

TOLYPE VELLEDA. *Stoll.* (No. 37.)

Larva. (Full grown.)

Body dull rusty black; the head rather smaller than the 2d segment, and streaked longitudinally with sordid white. The sides of the segments are produced into a long, blunt tubercle, from which spring out like a fan a series of very long hairs, some of which are ciliate, others with a fan-like termination. All the segments dorsally have 2 spinose tubercles, those of the third segment being very much larger than the others. On the sides of 4 is a broken whitish patch; on 8, another, which spreads over the dorsum; and on 11 and 12 others less distinct. The underside of the body, including the legs, is reddish flesh-color, with a velvety black spot between the legs. At the juncture of 4 and 5 is a fold, velvety black beneath, only visible when the *larva* is in motion.

Length, 2.00 inch.

Food plant. *Prunus*, *Populus* and *Syringa*. sp.

TOLYPE LARICIS. *Fitch*. (No. 38.)

Larva. (After 3d moult.)

Entire surface rusty brown, the segments are corrugated in large folds, each bearing dorsally transverse tubercles, those of the 4th and 9th being the largest. The lateral ciliae are attached to tubercles as in *I. vellela*, but are much shorter than in that species.

(After 4th moult.)

Rusty brown, paler than *I. vellela*, with the segmental tubercles similar in shape, but much smaller, and with the white blotches less distinct.

On *Larix Americana*. Michx., and other sp. of *coniferae*.

NOCTUIDÆ.

ACRONYCTA GRISEA. *Walk*. (No. 97.)

Larva. (After 3rd moult.)

Pale apple green, the dorsal region elevated into a ridge and marked with a broken brown dorsal line, broadest on 2, 3, 8, 9 and 10; the brown patch on 2 has its edges cream color: head pale green in centre, brownish on the sides, with paler marblings; 3, 4, 5, 6, 7 and 12 have small raised tubercles, bearing spines, and 2 bears bunches of long hairs. Lateral region wholly pale green, with whitish irrorations. Spiracles cream color, edged with black. Feet and legs concolorous.

Length, 15 mm.; width, 3 mm.

Larva. (Full grown.)

Head dull chestnut brown, with some darker markings; body wholly yellowish green, with slight brownish tint. On 7 and 8 is a broad brown triangular patch, the mark being continued slightly reducing in size to the anal segment. Each of the segments bears brownish tubercles, with short spinous hairs; those of No. 5 have 6 tubercles, of 8 and 9

three each, and the rest only 2; there is a faint sub-dorsal brownish line broken up into patches; the spiracles are brown, with redder brown patches above and below them. When at rest, segments 3, 4, 5 and 6 are very much elevated into a hump. All the tubercles bear short sharp hairs, and there is also a series along the lower lateral region.

Length, when at rest, 25 mm.; when feeding, 32 mm.

Food plant, *Ulmus*.

A variety of the caterpillar occurs, which is pale brownish, with a flesh tint, but agreeing in all its markings with the green form.

Food plant, *Viburnum*.

On changing to pupa, the larva loses the brown patches of the middle and posterior segments, and becomes wholly of a dull orange color.

ACRONYCTA OCCIDENTALIS. G. & R. (No. 46.)

Larva. (After third moult.)

Body wholly velvety black, as are also the head, legs, and entire under surface. Each segment is furnished with 7 small warty tubercles, from which spring bundles of short ochreous spines. The spiracles are white, and below them is a waved irregular line of pale reddish brown.

Length, 1.00 inch.

Full grown. Head pitchy, with deep sinus in the middle. Along the dorsum is a broad black band, extending on each side, in the middle of the segments, into a transverse line, on 5 to 10 only. This band bears on each of these segments 2 ochreous spots, between which are some whitish patches; the sub-dorsal lines are sordid flesh-color; those of the lateral region enclosing the spiracles are lead-color, the spiracles being black; the 2, 3 and 4 segments are wholly lead-color, only interrupted by the pinkish sub-dorsal stripe; the 12th segment bears a small hump, and the body is covered rather sparingly with long chestnut hairs.

Length, 1.25 inch.

Food plant, wild cherry.

ACRONYCTA LITHOSPILA. Gr. (No. 102.)

Larva. (Full grown.)

Very dark bluish green, darkest dorsally; head slightly truncate in front, with 2 slightly raised protuberances on the crown; pitchy with brown marks. The body is covered with rather long hairs; along the dorsum is a dull pink stripe, triangularly formed on the 6 anterior segments, then widening very much until the whole of the dorsum is covered on 7, 8 and 9, then narrowing again to the anal extremity. The middle and broad portion of this mark is darker than the anterior and

posterior portions; the hairs spring from small pinkish tubercles, the spiracles also being of a pinkish cast; under side all dull green.

Length, 35 mm.

On hickory. (*Carya alba*. L.)

AGROTIS C-NIGRUM. L. (No. 2.)

Larva. (Full grown.)

General color, dull brown; darker anteriorly. Head small, very shining, with two black streaks in front. There is but a faint indication of a pattern upon the segments dorsally, the whole of the markings being clouded and indistinct, being a little paler posteriorly. Upon the 11th, 12th, and 13th segments, however, are two oblique black velvety streaks directed towards each other posteriorly, and giving a strong character to the otherwise faint markings. Below the spiracles, which are white edged with black, is a rugged line of pale fawn-color. The underside, including the legs, is pale testaceous.

Length, 1.15 inch.

Food plant. *Cichorium Intybus* L.

May 2. Imago emerged June 4.

There are 2 broods of this species. The 1st brood appears in April, having hibernated in the larva state. The 2d appears in August, some of the hibernated individuals going over as late as this month.

MAMESTRA RENIGERA. Stph. (No. 1.)

Larva. (Full grown.)

General color, dark fawn brown; head shining, with narrow pale stripe in the centre and broader stripe at the sides. There is a pale narrow dorsal line, and on each segment, dorsally, a brown diagonal shade, on the apical points of which are small shining tubercles, each bearing a black hair. These tubercles are two to each segment. The marks of the two anal segments, instead of being diagonal, are triangular. There is a broad and decided black lateral line above the spiracles, and beneath this, enclosing the spiracles, which are black, is a waved double line of pale brown. Below this again is a pale fawn-colored corrugated fold. Underside, dull stone-drab. All the feet are black at the base.

Length. 1.00.

Food plant. *Cichorium Intybus* L.

Double-brooded; appearing in April and August.

EUPLEXIA LUCIPARA. L. (No. 79.)

Larva. (Full grown.)

Emerald green. Head, greenish testaceous; mouth parts pale pitchy. There is a very faint broken dorsal line, and a shading with a darker

green over the whole of the dorsum. The junction of the segments is yellowish. Spiracles very small, whitish, with broad black ring. The lower lateral space is pale bluish green. On the top of the 12th segment, which is somewhat swollen, are 2 small spots of clear white. The underside is wholly pale bluish green.

Length, 35 mm.

Food plants. *Viburnum*, *Betula*, etc.

ACHATODES ZÆ. Harris. (No. 18.)

Larva. (Full grown.)

Sordid white. Head and 2d segment jet black, shining, the latter occasionally white at the sides with 2 black spots. The 3rd and 4th segments have each 14 jet black shining points, 12 of which are placed transversely and somewhat irregularly, the other two in front, the lateral and sub-dorsal points being the largest. The other segments, except the anal, which is wholly black, have 12 black spots each, those of the dorsum being the largest. Feet black. Abdom. legs sordid white, with a black lunate mark at their junction with the body. Spiracles jet black.

Length, 1.00 inch.

In stems of elder (*Sambucus*) feeding upon the pith.

Pupa. Bright shining chestnut brown, the anterior portions of all the segments darker, roughened. The spiracles are also darker brown. The head is truncate in front, and furnished with two small roughened but pointed processes, which are probably used to break through the thin rind of the alder stem, as the larva feeds out a space, leaving on the outer rind a very thin portion to enable it to escape.

Length, 0.90 inch.

SCOLECOCAMPA LIBURNA. Geyer. (No. 3.)

Larva. (Full grown.)

Head and 2d segment pitchy black, very shining, bearing a few fuscous hairs. General color dull smoky, or greyish white, with a darker dorsal line. The outer integument is thin and transparent, and through it the circulation can be distinctly seen. From each of the segments spring 10 small brown tubercles, each bearing one or more fuscous hairs. These tubercles are placed laterally, the dorsal region being entirely free from them. The anal segment is pitchy, as are also the thoracic feet, the abdominal legs being concolorous with the body.

Length, 1.60 inch.

In decaying stumps of chestnut trees.

As soon as the larva is ready to transform it hollows out a small space in the ground at the base of the tree, which it covers with a thin web, and then spins a rather tough cocoon of pieces of wood, inter-

mingled with its own frass. The pupa is bright reddish brown, the segments edged with a darker shade. It is long, tapering much towards the anal extremity, very shining, with the antennal cases very prominent.

LITHOPHANE LATICINEREA. Grote.

Larva. (Full grown.)

Pale bluish green, whitish posteriorly. Head bluish green, narrower than the 2d segment, with a lateral line of very minute black spots. A faint whitish dorsal line. The segments are slightly corrugated, with numerous striæ, and very minute tubercles on each. The spiracles are jet black, with a broad bright lemon-yellow band below them. Feet and legs bluish green.

Length, 1.40 inch.

Food plant. Wild cherry.

CRAMBODES TALIDIFORMIS, Gne. (No. 24a.)

Larva. (Full grown.)

Rather a dull apple green. Head narrowed in front, with some faint white marblings at the side. A broken dorsal line composed of pink spots, sometimes pale, and in a few specimens quite obsolete. Two sub-dorsal broken lines of white spots and a broad, pink lateral line inclosing the spiracles. This line is usually widened a little in the middle of each segment above the spiracle. Between all the lines are a few white spots, irregularly placed. The spiracles are black.

Length, 30 mm.

The cocoon is formed of small fragments of sand, etc., spun together by silk, and is attached to any neighboring object, such as the stems or roots of plants, about one-half of the cocoon being below the surface of the soil. It is almost globose, or but slightly oval.

INGURA PRÆPILATA Grote. (No. 100.)

Larva. (Full grown.)

Yellowish apple green. Second segment with yellow line in front. All the segments have about 15 to 18 yellow spots irregularly disposed. Most of these spots are lozenge-shaped; those of the sub-dorsal region being somewhat linear. Spiracles dull orange, with bright lemon-yellow stigmatal line.

Length, 16 mm.

Food plant. *Liquidamber pyraciflua* L.

PYRRHIA EXPRIMENS. Wlk. (No. 55.)

Larva. (Full grown.)

Head, pale chestnut. Dorsal region broadly pinkish drab. The

lateral region, embracing the spiracles, is bright orange, and below these dull flesh-color, sprinkled with white. The second segment has 8 rather large jet-black tubercular spots in front, and 3 others on each side. The remaining segments have each 14 smaller black tubercular spots, those of 11 being the largest. The anal segment has a black transverse line at the base, then 4 black spots, and a row of the same color united along its posterior margin.

Length, 1.30 inch.

Food plant. *Desmodium* sp.

Pupa. Dark chestnut brown, very glossy, and elongated toward the posterior extremity. Cremaster a long, slightly hooked spine. The segments are covered with close, fine punctures, and the spiracles are a darker brown.

Length, 0.80 inch.

PARALLELIA BISTRIARIS. Hubn. (No. 89.)

Larva. (Full grown.)

Slate color, with lilac tinge; the whole surface covered with wavy lines and confused marks of a darker shade. The head is rather small, tapering in front, with 4 black longitudinal stripes. Between the segments is a greenish shade, and on each of these about 8 small white raised spots. The 10th, 11th and 12th have each a raised blackish line on the posterior half, that of 11 being the largest. Legs and feet striped with purplish brown.

Length, 45 mm.

Food plant. *Acer rubrum*. L.

GEOMETRIDÆ.

AMPHIDASIS COGNATARIA. Gne. (No. 32.)

Larva. (Full grown.)

Pale yellowish apple green. Head truncate in front, with 2 conical processes on the crown. Each of the segments is edged posteriorly with very pale dull yellow, and there are many very minute white and blackish warty tubercles scattered irregularly on the surface. There is a faint indication of a pale pinkish brown dorsal line. On the anterior portion of the anal segment is a warty protuberance of a brownish tint, surmounted by two cream colored processes. Thoracic feet and spiracles orange brown. Abdominal legs, green.

Length, 2.00 inch.

Food plant. *Melilotus*, *Acer* sp.

Larva changed to chrysalis. July 29. Imago, Aug. 13.

DESCRIPTION OF INTERESTING NEW SPECIES OF HETEROCERA FROM ALL PARTS OF OUR CONTINENT.

BY B. NEUMOEGEN.

PLATYTHYRIS GRANULATA. n. sp.

Antennæ, head, thorax, abdomen and legs grey. The tips of thorax and the abdomen, especially the former, powdered with orange.

Primaries of brownish grey color, traversed by innumerable little undulating lines from costa to interior margin, uniting into irregular small ovals at the intersection of the nerves, giving the appearance of numberless granules. These granules from base of wing to within a short space from exterior margin tinted with reddish orange. The space along exterior margin is grey. Fringes of a darker brownish grey than primaries, with a white curve at inner angle. An irregular, vitreous, discal spot at the inner edge of a greyish brown transverse band, which is broadest at costa and sharpens considerably at junction with interior margin. Along costa five irregular, partly triangular spots of straw yellow, two of them near inner edge of transverse band, one in the middle of the same, and two at the anterior edge of the band. Shape of wing curved at middle of exterior margin and at inner angle.

Secondaries concolorous, from base to within exterior margin, where the brownish grey prevails, the granules are likewise tinted with reddish orange. A vitreous discal spot, about four times larger than the one on primaries, of irregular square shape, cut in triangularly at anterior edge, giving it the appearance of having two pointed teeth. Wing curved in at centre of exterior margin and at anal angle.

Beneath, primaries and secondaries of light straw color, the transverse lines, which form the granules, of brownish color. Brownish shading near apex of primaries, the transverse band brown, and vitreous discal spot prominent. The five costal spots plainly visible. Brownish tinge near base and around discal spot of secondaries. Fringes as above.

Expanse of wings, 23 mm. Length of body, 6 mm.

Habitat: Fort Huachuco, Arizona. Type ♀, coll. B. Neumoegen.

NEMEOPHILA GEDDESI. n. sp.

Antennæ, head and abdomen black. Thorax, collar and an anal tuft of bright yellow. The abdomen has lateral stripes of straw yellow, and segmentary bands of same color near anus. Legs straw yellow.

Primaries black, with two prominent markings in straw yellow. One an oblique, broad, irregular band from costa to exterior margin above anal angle, thus separating the wing into an irregular, triangular, black apical patch. The inner part of this band edges off inwardly near median nervure, and runs parallel with same, thus giving the band the appearance of being toothed, the outer tooth only touching the exterior margin. The other is a broad basal stripe along median nervure, sharpening towards centre and nearly in conjunction with inner tooth

of transverse band. A minute oval spot of straw yellow resting on middle of submedian nervure. Costa bright yellow near base, but fading off towards apex. Fringes black along exterior margin, but of straw yellow along interior margin to anal angle.

Secondaries black, with the following markings in straw yellow. An irregular, broad, mesial band along costa and running parallel at a distance with exterior margin, terminating at median nervules, where it is sharpened inwardly. An irregular shade, split by a black line, along abdominal margin, ending at anal angle, hooked inwardly. Fringes along abdominal margin and anal angle of straw yellow, thence along exterior margin strongly intermixed with black.

Beneath the markings are as above, both on primaries and secondaries.

Expanse of wings, 29 mm. Length of body, 8 mm.

Habitat: Crow's Nest Pass, N. W. Brit. Cola. Type ♂, coll. B. Neumoegen. (Capt. Geddes.)

Dedicated to Capt. Gamble Geddes, of Toronto, who last season braved the inconveniences of a three months' sojourn in the Athabasca region, in order to enrich our science.

This beautiful insect was seen years ago by my friend, Mr. Hy Edwards, in a collection in Vancouver, but the superstitious possessor would not allow Mr. Edwards to make a description of it. Thus it has fallen to me to be the first one to describe it.

HALESIDOTA MINIMA, n. sp.

Head, thorax, patagiæ, abdomen pale, ochreous, hairy. Legs pale ochreous.

Primaries brownish, intermixed with ochreous tint. Maculations at base, along costa and at apices pale ochreous. Three irregular, undulating, transverse shadings from costa to inner margin; the two anterior ones accompanied by a row of irregular dots. The shading is the darkest around ochreous, basal maculation, and along exterior margin. One large, oblong, ochreous spot resting on costa, not far from base, followed by two, and more anteriorly towards apex, by three irregular, transparent spots, the latter being the start of the central transverse shading. Fringes brownish.

Secondaries immaculate, creamish white with concolorous fringes.

Beneath the markings on primaries are faintly reproduced, the ochreous tint at base and of anterior transverse shading more pronounced.

Expanse of wings, 31 mm.

Length of body, 6 mm.

Habitat: Fort Huachuco, Arizona. (Morrison.)

♂ Type, coll. B. Neumoegen.

This is the smallest of our Halesidotas, and, in appearance, the nearest relative to our *H. Caryæ*.

EULEUCOPHAEUS HUALAPAI, n. sp.

Head dark rose with yellowish tint. Prothorax, patagiæ, thorax very hairy, creamish white with scattered dark rose colored hair.

Abdomen very hairy, dark rose intermixed with creamish white hair and yellow tinted segmentary bands. Abdomen beneath light rose with whitish tint. Antennæ and legs bright yellow. The latter clothed with whitish rose hairs.

Primaries immaculate of very light rose color, along fringes and inner margin whitish. Costa bright yellow. A transverse, well pronounced, semi-transparent discal dash, surrounded by yellowish color. Light indication of a whitish transverse, oblique band, from costa near apex and parallel with outer margin. Light rose tint near base.

Secondaries of rose color, more intense near base. Fringes and hair along abdominal margin creamish white. A discal spot of the latter color.

Beneath, primaries and secondaries of bright rose; the secondaries of a lighter shade than primaries. Primaries from base and along median vein clothed with rose colored hair. Costa of the brightest yellow. A basal blotch, near conjunction of inner margin, of same color, and the course of the nerves indicated by yellow lines.

Base of secondaries near anterior margin clothed with rose and yellow hair. Fringes and hair along abdominal margin creamish white. Discal spots visible both on primaries and secondaries.

Expanse of wings $2\frac{1}{2}$ inches.

Length of body $\frac{5}{8}$ inch.

Habitat: S. W. Arizona. (Morrison). Type ♀. coll. B. Neumogen.

This is a fine insect distinguishing itself by its rose tint.

HYPOPTA MANFREDI, n. sp.

Antennæ heavily feathered, light brownish, white stemmed. Thorax, abdomen and legs heavily furred with creamish white hair.

Primaries creamish white, fringes concolorous. Some minute, diffused sprinkling of light brown, and a discal dash of same color.

Secondaries somewhat darker, but uniform in color.

Beneath, primaries blackish with a lighter indication of discal dash of the surface. Near base and along larger part of inner margin a shade of creamish white and the fringes of same color.

Secondaries creamish white with a shade of light brown cast over it. Lightest near base and at anal angle.

Expanse of wings 30. mm.

Length of body 10. mm.

Habitat: S. W. Arizona. (Morrison.)

♂♂ Types coll. B. Neumoegen.

Named for Manfred Neumoegen.

This insect is much smaller than *H. Bertholdi* or *H. Henrici* and can be at once recognized by its plain color.

HADENA TRANSFRONS, n. sp.

Antennæ brown. Head grey. Thorax grey, intermixed with brown. Collar brown. Abdomen dark grey, shading into light brown beneath. Light brown anal tuft. Legs brown.

Primaries yellowish grey with maculations in light and dark brown,

as follows: A dark brown marginal line along exterior margin; an irregular transverse line from near apex to interior margin, outwardly toothed at intersection of nerves; at costa, this line starts with an irregular, square, dark brown spot. The space between this line and exterior margin is yellowish grey, having a dark brown marginal maculation at centre of exterior margin and a more prominent, nearly triangular, dark brown blotch at inner angle. Through the centre of the space an irregular, transverse row of light brown dots. A second transverse line curving around base, starting with a dark brown blotch at costa and terminating with dark brown maculations at interior margin.

The interspace between the anterior and inner, basal transverse lines filled up with vivid light brown and having a large brown dash, pointing inwardly and resting on submedian nervure. A large, irregular square discal dot, surrounded inwardly by a prominent dark brown blotch, fringes yellowish grey, toothed with dark brown.

Secondaries uniform black, fading somewhat into greyish black toward base, fringes light brown.

Beneath, primaries dark brown fading into light brown at base and along interior margin. Indications of the anterior transverse line.

Secondaries light brown with a dark brown marginal band and a small, but distinct dark brown discal dot.

Expanse of wings. 26. mm.

Length of body. 9. mm.

Habitat: Deer River, N. W. Brit. Cola. (Capt. Geddes.)

Type ♂. coll. B. Neumoegen.

In appearance ranking near to *H. Bridghamii*, G. & R.

HADENA SMARAGDINA, n. sp.

Antennæ light brown. Head and thorax grey black. Abdomen and legs grey, with a blackish shade.

Primaries of a beautiful smaragd green, especially at base, along costa and exterior margin and at inner angle. Maculations, dark black, surrounded by brownish shades, giving the green wings much the appearance of being checkered with black, irregular square spots. Three transverse lines. The most anterior from apex to inner angle, undulating and consisting of irregular dots. The second, more inwardly, resting on middle of interior margin and similar to anterior line. The third curving around base from costa to interior margin. The interspaces between the transverse lines filled up by irregular checkers of brown shades, those between the inner curving line and the middle transverse line alternating in black and green. Fringes brown.

Secondaries greyish white, with broad, blackish marginal band from apex to anal angle, fading towards centre. Lightest at base. Fringes blackish, with a marginal line along exterior margin, of small, distinct black dashes. Faint indication of an undulating, transverse line through the centre.

Beneath, primaries greyish black, with lighter greyish shading at base and along interior margin. The middle transverse line and a small discal dot, of somewhat darker color, plainly visible.

Secondaries greyish white, with a shading of greyish black along costa and exterior margin. The middle transverse line and a small discal spot of greyish black, quite distinct.

Expanse of wings, 27 mim.

Length of body, 8 mim.

Habitat: S. W. Arizona. (Morrison.)

Type ♂, coll. B. Neumoegen.

This insect ranks certainly as one of the handsomest *Hadenas* of our country.

PSEUDANARTA FALCATA, n. sp.

Antennæ, head, thorax and abdomen light brown, with anal tuft of a lighter shade. Under side of abdomen and legs of the same lighter shade.

Primaries very pointed at apex, then considerably bulging out along exterior margin and rounding off at inner angle. Color of same a light brown. A light transverse line from near apex to interior margin; the space enclosed between the same and exterior margin of a lighter shade, darkening along the latter and showing faintly a marginal line of irregular dots from apex to inner angle. Another faint, oblique line from costa near base to middle of interior margin, nearly joining there the anterior transverse line. A faint, whitish reniform discal ring, having a larger, oblong, anterior companion ring. Fringes light brown.

Secondaries and fringes bright yellow, immaculate, with a distinct, broad black marginal band from costa to anal angle.

Beneath, primaries bright yellow, slightly dusted with brown grains along costa. A broad, black transverse marginal band, covering nearly one-third of the wing.

Secondaries bright yellow, slightly dusted with brown along costa. The same broad, black marginal band as on surface. A small black discal dot.

Expanse of wings, 20 mim.

Length of body, 8 mim.

Habitat: Ft. Huachuco, Arizona (Morrison.)

Type ♂, coll. B. Neumoegen.

The only representative of its tribe with falcate wings, so far known, nearing otherwise in appearance *A. flava*, Hy. Edw.

STIBADIUM CURIOSUM, n. sp.

Antennæ light brown. Head and thorax whitish grey, sprinkled with brown. Abdomen and legs whitish grey.

Primaries very pointed at apex; exterior margin bulging out at centre, but retracing towards inner angle, giving the cut of the wing

a curious, falcate form. Color of primaries greyish brown, with intenser shading at centre of wing, the shading assuming somewhat the form of minimal granules. A transverse greyish white line from apex to near middle of interior margin, bending considerably inwardly at its centre. Another transverse line from costa, near base, to interior margin. The space enclosed by the two transverse lines being the most intensely colored part of the wing. A prominent, semi-circular black apical spot. A reniform discal spot, accompanied inwardly by another rounded dot.

Secondaries silvery grey, with blackish exterior margin, fading towards centre of wing. Indications of light mesial line.

Beneath, primaries of uniform brownish grey, somewhat lighter along costa and exterior margin. Secondaries of silvery grey, slightly dusted with light brown.

Expanse of wings, 25 mm. Length of body, 8 mm.

Habitat: South Arizona. Type ♂, coll. B. Neumoegen.

This insect proves to be of the genus *Stibadium*, in spite of its curiously formed primaries.

SCHINIA (PORRIMA) CARMOSINA n. sp. .

Antennæ, head, thorax and abdomen dark grey. Abdomen beneath and legs of a lighter shade.

Primaries of a brilliant red purple color, nearing the tint of a light garnet, mixed with fleshy carmine tints. A broad transverse band of light brown, broadest at its start at costa, narrowing towards centre and widening at its termination on interior margin. The interior and anterior lines of this band are toothed with whitish color at intersection of nerves. The course of median and submedian nervures while crossing this band, indicated by lighter color. An exterior black marginal line, consisting of conspicuous black dots at termination of nerves. Fringes brown.

Secondaries of an uniform brownish black, somewhat fading towards base. with yellowish fringes. Slight indications of the discal dot.

Beneath primaries brownish black with lighter, greyish shades along costa, exterior and interior margins. At apex a blotch of bright carmine, purple tint, nearing the color of light garnet, diminishing in size and ending pointedly at centre of exterior margin. The latter dotted with black at termination of nerves.

Secondaries brownish black, fading into lighter color in centre and at base, being most intense at anal angle. A broad marginal shading from costa to middle of exterior margin of the same bright carmine purple tint, gradually fading towards centre. A large brownish black discal dot.

Expanse of wings, 28 mm. Length of body, 5 mm.

Habitat: Central Florida.

Type ♀. Coll. B. Neumoegen.

Undoubtedly one of the most brilliant North American Heliethinæ, and nearest relative to *P. Sanguinea*, Geyer, from which it is easily distinguished by its smaller size, intenser coloring, the dark grey head, thorax and body and the black secondaries.

DRASTERIA DISTINCTA, n. sp.

Head, thorax and body creamish white with a light bluish tint. Antennæ grey. Legs creamish white.

Primaries of a light blue tint with the following markings in brown: A transverse line of irregular dots from costa to interior margin, parallel with exterior margin. The dots resting at intersection of nerves. The two upper dots near apex the largest and most accentuated in color. Between base and this line two more irregular transverse lines, nearly connecting at interior margin, thus forming an irregular triangular space, the centre of which is marked by a large, transverse reniform circle. The space shaded with brown. A marginal brown line along exterior margin; costa and fringes brown.

Secondaries creamish white fringes concolorous. From apex to anal angle a brown marginal, distinct line. Parallel with it, but pointed outwardly at centre, an undulating, mesial band, joining marginal line at anal angle. Indications of another interior mesial band of same color from centre of costa to abdominal margin, hooked in at junction with latter. Base densely shaded with brown, fading off along abdominal margin.

Beneath, primaries and secondaries creamish white, powdered with brown grains. Small brown discal spot on primaries. Marginal lines of both wings distinct.

Expanse of wings, 28 mm. Length of body, 7 mm.

Habitat: Belly River, N. W. Brit. Cola. (Capt. Geddes.) Types, ♀ ♀. Coll. B. Neumoegen.

D. distincta is near to *D. coerulea*, but not as vividly colored and plainly distinct at first glance by its creamish white secondaries.

SYNEDA ATHABASCA, n. sp.

Antennæ, head, thorax and abdomen grey. Abdomen beneath and legs very light grey.

Primaries very dark, nearly blackish, grey; fringes concolorous. A broad, light grey marginal band, accentuated by a dark grey blotch at apex, and terminating at inner angle, having an anterior black marginal line. A broad, light grey, oblique band, from costa near base to middle of interior margin and nearly joining at latter the marginal band. The space between the oblique and marginal bands very dark grey, having at its upper centre a prominent irregular square, discal blotch of whitish grey, from costal to median nervures, being toothed at intersection of nervures.

Secondaries yellowish white. A black marginal line from apex to anal angle, having two triangular black blotches, pointing inwardly.

A prominent, broad, undulating black mesial band from costa to anal angle, joining at latter the marginal line. A black basal dash along abdominal margin, and a prominent black, discal line, resting on median nervure, the inward course of which it marks in black, fringes yellowish white with black, intermediate maculations.

Beneath, primaries and secondaries milky white with black maculations. Primaries have a distinct marginal line, anterior transverse undulating band, large discal spot of black. Secondaries have likewise the marginal line with blotches, the undulating mesial band and the discal line of black.

Expanse of wings, ♂ 25 mm. ♀ 27 mm. Length of body, ♂ 7 mm. ♀ 8 mm.

Habitat: Belly River, N. W. Brit. Col. (Capt. Geddes.)

The smallest, but one of the most graceful-looking of our *Synedas*.

THE MACHAON CONTROVERSY.

SIR,—The note in the Machaon controversy in the May-June number of "Papilio" was written by me immediately after reading Mr. W. H. Edwards' article in the March number, and was, if I mistake not, in the form of a letter, as I did not consider it of sufficient importance to make an article of it. Since then, however, I have been in Boston, and through the kindness and courtesy of Dr. Hagen I have had an opportunity of carefully examining the fine and remarkable series of *Papilios* collected by him and his associates last summer, and my views have been modified in consequence. As the result of this examination I find that the striped ocellus figured by Mr. Edwards as the typical form in *Oregonia* is not at all common among these specimens, most of them having the pupil broadly pear-shaped above, sometimes nearly triangular and sometimes even separated from the interior anal band, and so closely resembling that of *Zolicaon*. One specimen in which the ocellus and pupil were nearest that figured as *Oregonia* by Mr. Edwards, has a black cell and a nearly black body. One specimen has the pupil on the upper side very slightly clubbed, and sloped down very near to the inner edge, so as to closely resemble in this particular a specimen of *Machaon* from Koolloo, in the Himalayas. This wide variation in the form of the pupil of the ocellus is very marked. Mr. Edwards says on page 55, that "the marginal yellow spots of these several members of the *Asterias* group are very similar to those of *Zolicaon*." From the extreme variation of these spots in these specimens, I should judge that they must be worthless for the separation of species.

Mr. Edwards says that these specimens are hybrids. This is, I suppose, possible; but is it probable? For my part, I do not believe that a party collecting a large series of butterflies would find nothing but hybrids.

In conclusion, I would simply state that in my humble opinion there is more to be learned about these forms than either Dr. Hagen or Mr. Edwards can at present tell us.

Yours respectfully,

H. H. LYMAN.

Montreal, Sept. 17, 1883.

SOME SPECIES OF EUCHÆTES.

BY HENRY EDWARDS.

Considerable confusion has hitherto existed among entomologists in the determination of the species of this genus hereafter referred to, many lepidopterists having fallen into the error of believing them to be forms of one and the same thing, and regarding *E. collaris* as merely an albino state of *E. egle*. In many cabinets it is still so named, but it has remained for Mr. S. Lowell Elliot, of New York, to clear away all the existing difficulties, and to place the several forms in their proper rank as species. And here I would wish publicly to pay my respect to Mr. Elliot for the vast services he has rendered and will hereafter render to entomology, by the persevering and earnest manner in which he has reared a great number of lepidoptera through all their stages from the egg upwards, and the unparalleled care he has taken to prevent any mixing together of species, thus avoiding any possibility of mistake. Thousands of examples have passed through his hands during the past two years, the larvæ being described in all their moults, and watched with unremitting attention. To Mr. Elliot American lepidopterists will, when the results of his observations are fully known, owe a debt of gratitude it will be difficult to pay. In the genus *Datana* alone upwards of 10,000 specimens of the various forms have been under his care, and the differences between them carefully and studiously noted. In the present genus enormous numbers of specimens have been raised, and the results here stated are beyond the chances of error. It will be seen that the fall brood of *E. eglenensis* is white, and superficially resembles *E. collaris*, while the spring brood is lead color, and closely approaches *E. egle*. This will help to account for the erroneous impressions I have referred to as to the association of the several species under one. I have thought it wise to include in this paper redescriptions of all the species, under the new light given to them by the efforts of Mr. Elliot, and have also given names to one variety of *E. egle*. and to a probable species allied to *E. collaris*. The first of these was noted by Mr. Grote, and I append his description, applying to the insect the name given to it by him. The other has, I believe, so far been taken only by myself in the Yosemite Valley, California. Its early stages are unfortunately unknown to me, but the present reference to it may, I trust, attract the attention of observers, and finally bring us some information as to its larval condition.

EUCHÆTES COLLARIS. Fitch.

Larva. (After 2d moult.)

Body color, greenish-white. Head, slightly testaceous. The body is covered with very long, sordid, white hairs, those of the anterior portion the longest. A darker dorsal line, contrasting with the white ground-color.

Length, 8 mm.

(After 3d moult.)

The body has now become a clearer white, and the hairs are disposed more in the form of tubercular tufts, and not irregularly, as in the previous stages, the segments being marked by a deeper shade.

Length 12 mm.

(After 4th moult.)

Wholly sordid white; the hairs now plainly disposed on pale tubercles, each bearing a large tuft of hairs, which are cream-white at their base, slightly stained with dusky at their tips.

Length, 20 mm.

(After 5th moult.)

Head pale, testaceous. The hairs have now become pale mouse color, varying in some individuals to a darker shade. The body color and that of the legs are now dull greenish-white.

Length, 28-30 mm.

Food Plants:

Asclepias, of several species; and *Apocynum cannabinum*. The larvæ feed only at night, hiding themselves during the day at the foot of their food plant.

Imago. Palpi, fore coxæ, abdomen above, part of thorax, a costal streak *continued to the apex*, and the costal edge of secondaries beneath, bright buff. The abdomen has three rows of black spots, those of the dorsum the largest. The wings are pure white above, rather acute at the apex; the primaries with a sub-costal, lead-colored shade beneath, not reaching to the apex. The abdominal spots are occasionally almost obsolete.

Exp. wings, ♂, 35 mm. ♀, 42 mm.

EUCHÆTES YOSEMITE, n. sp.

Wings pure white above and below, except a buff shade on the costa of primaries, *not extending beyond the basal third*, and a very slight lead-colored sub-costal shade beneath. *Costal edge of secondaries, cream white.* Abdomen cream-white, with the posterior edges of the segments pale buff. Dorsal black spots quite conspicuous. Otherwise, as in *E. collaris*

Exp. wings, ♂, 45 mm. ♀, 48 mm.

From several examples taken by myself in the Yosemite Valley, California.

The difference between this form and our common species will, I think, be easily seen upon comparison; the larger size, white abdomen, and shorter buff costal streak being strong characters, entitling it, I think, to rank as a species. The whole of the examples I saw were constant in their markings, not less than 20 having been examined by me.

EUCHÆTES EGLIENSIS. Clem.

Larva. (Full grown.)

Body wholly bright dark orange. Head rather small, shining. On each segment are 7 tufts of mouse-colored hairs, those of the second and third segments being the longest. These hairs spring from small brownish tubercles. The base of abdominal legs, brownish at the sides.

Length, 1.10 inch.

Food Plant, species of *Asclepias*, but chiefly *A. tuberosa*.

Imago. (Fall brood.):

Wings white, with a pinkish or lead-color tinge. Costal margin distinctly buff for its basal half. Abdomen bright buff, strongly marked with the usual rows of black dots. Apices of the wings more decidedly rounded than in *E. collaris*, and the lead-colored shade beneath extends more generally over the surface. The veins of the upper and lower wings also are decidedly marked with yellow. Palpi and legs as in *E. collaris*.

(Spring brood.):

With the same markings, but the whole upper and lower surfaces of the wings are bright mouse-color, this shade encroaching on the collar of the thorax and the fore coxæ.

Exp. wings ♂, 30 mm. ♀, 32 mm.

EUCHÆTES EGLE. Drury.

Larva.

Black, entirely covered with long hairs and tufts. Dorsal region wholly black. From each side spring 11 bunches of bright orange hairs, which almost meet each other on the dorsum. From the 2d and 3rd segments arise 4 long pencils of black hairs. From the 4th, 2 pencils, and behind these 2 smaller but longer ones, all of clear white. These are all directed anteriorly. From the 11th and 12th spring other long black pencils, 2 to each segment. These are directed posteriorly. Behind these again are 2 pencils of clear white hairs. The anal segment bears a long and fan-like black tuft. From the sides of the middle segments spring shorter pencils of black hairs, directed laterally, and below these, covering the spiracles, are some sordid white tubercular masses of hairs, as in some *Arctias*.

Length, full grown, 1.10 inch.

Food plants, various species of *Asclepias*, but chiefly *A. cornuti*. Desc.

Imago. (Spring brood.):

Stouter and heavier in appearance than any of the previous species. Entire surface, with the exception of some buff stains at the base of the head, of the wings beneath, and the junction of the coxæ, bright mouse-color, the secondaries rather darker in tint. There are no markings whatever upon the wings, and the buff costal edge is entirely wanting. The abdomen is buff above, cream white below, with the usual row of black spots, and in the ♀ the anal segment is broad, cream white, in strong contrast to the rest.

(Fall brood.):

In this, there is upon the primaries of both sexes, a very decided band of a darker shade than the ground color, very oblique, and deeply dentate outwardly. There are also numerous whitish scales scattered over the surface of the wing. This form has been described by Mr. Grote, though never published, as *E. cyclica*.

Exp. wings, ♂ 30 mm. ♀ 38 mm.

With regard to the distribution of the species, I may state that I have seen no examples of *E. egle*, except from Pennsylvania, New York, and the New England States, while *E. egle* and *E. collaris* appear to have their range as far south as Texas, the former of these also appearing in Arizona.

THE GENUS ARCTIA AND ITS VARIATIONS.

BY B. NEUMOEGEN.

My good friend, the Rev. Geo. D. Hulst, has lately given us in the Bull. Brooklyn Ent. Soc., vol. ii., p. 69, some interesting accounts about the raising of a number of imagos from the eggs of *A. Excelsa*, Neum. They proved to be varying greatly, as he says, starting with forms near *A. decorata* through the *F—pallida*, *Excelsa* forms, winding up with specimens tallying with *A. figurata*. The genus *Arctia* is extremely variable in its ground forms, as everyone knows, and that specimens greatly varying from the same and highly aberratic should have been baptized by specific names, is only too natural. I myself had some misgivings at the time of naming *A. Excelsa* as a species, but as the fundamental form was not then known, I preferred to have it go as a species; the present discovery, to my pleasure, teaches me that it is an aberratic form. While my friend Hulst has been quite successful in establishing interesting facts and thus partly sifting some of the mysterious conceptions of years' standing, I think he has rather been too liberal in his conclusions, which do not warrant his positive way of stating "the synonymy of *A. Nais* 'stands' as follows," or "the insect 'stands' *A. Parthenice* v. *Anna*." Although I do not

in the least harmonize with many of my entomological friends, who, microscopically, dissect a fundamental form into so many varieties, I still more object to the very recent mania of "lumping" species. Future entomologists will easily know that, for instance, by Cat. *Carissima*, Hulst, a certain varietal form of *C. Cara* is meant. Will it be just as easily taken, that *A. placentia*, Abb. & Sm., or *A. Snowi*, Gr. are the same insects as *A. Nais*, because it has been proven that *A. Phalerata*, *Phyllira* and *Excelsa* are aberratic forms, the first one of *Nais*, the latter two of *Figurata*? Varieties are the heralds of coming species; why then retrench the obvious plan of nature instead of submitting to it? Mr. Hulst has raised various forms, mentioned before, from *Excelsa* eggs, but not the true *Nais* form; why then the conclusion that *Nais* is the typical insect of these forms? Still more problematical is the decision that *A. Blakei*, *determinata*, *Bolanderi*, *superba*, should be included into the same species of *Nais*. Will future students take it for granted, by dint of such decisions, that *A. Bolanderi* from Oregon and Athabasca (from the latter locality I received it lately through Capt. Geddes), and *A. Phyllira* from the Southern States have the same larvae? As soon as my friend Hulst has raised them from the same brood of caterpillars, I shall say: *Probatum est!*

Collectors of Chicago (Mr. Bolter and Mr. Worthington) and of Canada (Capt. Geddes and others), have found the larvae of *A. Decorata* considerably differing from *A. Nais*, so has Prof. French, of Carbondale, Ill., as my friend Hulst says; why then does he place it as a var. of *Nais*?

Some studies and examinations which I have been making lately, prompt me to the following opinion:

A. Saundersii is a good species and distinct from *A. Parthenice*, Kirby. *A. Parthenice* is an aberratic form of *Virgo*, in which the cross and transverse bands of primaries are much broader than in *Virgo*, the secondaries having very few and small black maculations. In the collection of Mr. Hy. Edwards are some samples bearing out the true specific of *Parthenice*.

A. flammea, Neum., is a varietal form of *A. Placentia*, Abb. & Sm.

A. Placentia and *A. figurata* have no specific connection. The caterpillars are entirely different, as figured in the Lepidoptera of Georgia, by Abb. & Sm.

I possess the type of *A. Anna*, Gr., which is undoubtedly an aberration of *A. Persephone*. Had my factotum, Mr. Doll, been fortunate enough to carry a number of larvae of *A. Persephone* through the various moults, it would have been settled to a certainty that *Anna* and *Persephone* are from the same stem. Unluckily, Mr. Doll did not succeed.

A. complicata, Wlk. is a var. *ochracea* of *A. Achaia*.

A. Edwardsii, Str. will probably prove to be a varietal form of *A. Achaia*, Gr. & R.

A. Blakei and *A. determinata* may have specific relation, but cannot be authenticated so far.

A. Nevadensis, Gr. & R. is a varietal form of *A. incorrupta*, Hy. Edw., which is the ground form.

A. Quenselii, Geyer, *Gclida*, Mösch., and *Speciocissima*. Mösch. are synonyms.

A. Docta, Wlk., *mexicana*, Gr. & R., *Autholea*, Bd. and *Arizonensis*, Str. are variations of the same insect, Walker's name having the precedence.

A. Dahurica, Bd. may prove to be only *Complicata*, Wlk., which latter, as mentioned above, is an ochraceous var. of *Achaia*.

A. intermedia, Str. is distinct from *A. Saundersii* and I do not see why Mr. Grote placed them as synonyms. *Intermedia* is much larger than *Saundersii* and differs in its transverse and cross bands vastly from the latter.

A. Stretchii, Gr. may prove to be only a variety of *A. intermedia*. I have the type of *Stretchii* and the following note of Mr. Grote is attached to it: "Differs by the basal band on forewings." This is about the only difference, in fact, which I can see between *A. Stretchii* and *A. intermedia*.

A. Dione, Ab. & Smi., I can positively state, is a distinct species from *A. Arge*, Dru. It is much larger than *Arge*, has very small, black maculations on primaries; the cross bands are in fact, no bands but simply a line of black dashes. The wings are of a creamish white color; but the main distinction is in the abdomen, which is creamish white and has neither black dorsal nor black lateral stripes, but simply two black anal dots. I owe it to the kindness of Prof. H. A. Hagen, that I was enabled to elucidate these facts. He lent me two typical examples of *Dione*, property of the Cambridge Museum, for examination. They were caught many years ago by the late Prof. Agassiz in Texas and were labelled hitherto "*Arctia* n. sp."

According to the opinion expressed herein, I should classify our *Arctians* for the present as follows:

Arctia, Virgo L.

- " ab. *Parthenice*, Kirby.
- " ab. *Intermedia*, Str.
var. *Stretchii*, Gr.
- " *Saundersii*, Gr.
- " *Rectilinea*, Tr.
- " *Persephone*, Gr.
ab. *Anna*, Gr.
- " *Nais*, Dru.
v. *Phalerata*, Harr.
- " *Decorata*, Saund.
- " *Figurata*, Dru.
v. *Celia*, Saund.
v. *F. pallida*, Strk.
v. *Quadrinotata*, Strk.
v. *Excelsa*, Neum.
v. *Phyllira*, Dru.

- Arctia, Placentia, Abb. & Sm.
 v. Flammea, Neum.
 “ Snowi, Gr.
 “ Determinata, Neum.
 “ Blakei, Gr.
 “ Superba, Str.
 “ Bolanderi, Str.
 “ Yarrowi, Str.
 “ Incorrupta, Hy. Edw.
 v. Nevadensis, G. & R.
 v. Ochracea, Neum.
 “ Docta, Wlk.
 v. Arizonensis, Str.
 v. Autholea, Bd.
 v. Mexicana, G. & R.
 “ Virguncula, Kirby.
 ✓ “ Achaia, Gr. & R.
 v. Barda, Hy. Edw.
 v. Complicata, Wlk.
 v. Ochracea, Str.
 v. Dahurica, Bd.?
 “ Quenselii, Geyer.
 Gelida, Moschl.
 Speciosissima, Moschl.
 “ Geneura, Strk.
 “ Williamsii, Dodge.
 “ Edwardsii, Str.
 “ Dione, Abb. & Sm.
 “ Arge, Dru.
 “ ab. Michaho, Gr.

Whether some of the species can “stand” as such, we shall have to leave to future discoveries for positive proof. My thanks are due to Messrs. I. Doll, Hy. Edwards, Geo. Frank, Capt. Geddes and Dr. H. A. Hagen for valuable information. I trust that Mr. Hulst will take no umbrage at my remarks, as in the friendly contest for science, both victor and vanquished gain.

CONCERNING SO-CALLED SPECIES OF BUTTERFLIES.

BY H. J. ELWES. PRESTON, CIRENCESTER.

Dr. Hagen's paper on *Papilio Machaon* and its allies has already brought down on him severe criticism from Messrs. W. H. Edwards and Butler, who are the leading representatives of a particular school in Europe and America; and though Dr. Hagen can doubtless fight his own battle in so good a cause, and defend himself without the help of others, yet I should like to make a few remarks on the controversy. Mr. Edwards seems to think just as Mr. Butler did when I ventured some notes on the Genus *Colias* three years ago in the Transactions

of the Entomological Society, that because a man has not been a lepidopterist and nothing else all his life, he has no right to speak or to have an opinion on the subject. It seems to me, however, that the best possible training for the study of any branch of natural history is a previous acquaintance with some other branch.

And the mere fact that Dr. Hagen is allowed by his opponent to hold a high rank in other branches would dispose me without knowing personally anything of himself or his work to allow greater weight to his opinions on lepidoptera.

I have noticed that men who have studied one branch of biology in one country only, are usually more ready to give importance to trifling characters than those who have observed the marvellous variation of birds, insects, and plants, in many parts of the world. Perhaps nothing does so much to shake one's faith in the fixity of species as horticulture, though breeding butterflies from the egg seems to have had the opposite effect on Mr. Edwards.

If, however, this gentleman and others had always waited till they had reared an insect before describing it, neither I or any one else could object, however narrow their views as to what constitutes a species might be, as there would in that case be solid foundation for their opinions.

But it is quite another matter when we find a crowd of new forms described on the sole evidence of one or more specimens brought on by some traveller, which happen to differ slightly from those already known, and when the descriptions are unaccompanied by figures, they give little or no help to identification.

To enter into the question of *Papilio Machaon* and its allies would take more time than I can now spare, but I hope before long to show that there is a much greater resemblance between the butterflies of the Nearctic and Palearctic regions, than has been hitherto allowed by most American writers. In fact, I believe that as far as butterflies go, these two regions cannot be separated at all, for though numerous genera occur in the warmer parts of the United States, which are not represented in the old world, yet they cannot be called dominant genera, and for the most part are either small monotypic genera or representatives of neotropical genera which have strayed northward and been able to maintain their ground where climatic conditions are favorable, just as in the Eastern Palearctic region several tropical Indian forms are able to exist far beyond the limits of the region to which they naturally belong. Both in the United States and in Japan we have similar instances among birds and plants, which it would be out of place to mention here, though any naturalist will call to mind such cases in geographical distribution.

As I have lately been studying the genus *Argynnis*, I will now ask Mr. Edwards publicly, what I have asked privately without result, how I am to distinguish with certainty from their allies the following species, all of which being enumerated in the last part of his great work are, I presume, considered by him to be worthy of recognition.

- Argynnis Nitocris Edw. Tr. Am. E. Soc. 5 15 1874.
 “ Carpenteri Edw. l c. 5 204 1876.
 “ Electa Edw. Field and Forest, 3 143 1878.
 “ Hippolyta Edw. Can. Ent. 11 82 1879.
 “ Laura Edw. l. c. 11 49 1879.
 “ Chitone Edw. l. c. 11 82 1879.
 “ Macaria Edw. Field and Forest, 3 86 1877.
 “ Clio Edw. Tr. A. E. Soc. 5 106 1874.
 “ Artonis Edw. l. c. 9 2 1881.

So far as I have been able to consult the description of these species I find nothing to guide me in accepting or rejecting them, but those published in the *Field and Forest*, I have not been able to consult at all, as that journal is not accessible to me in England.

There are no specimens of any of these species in any European collection that I know of, and if there were, I could not trust to them unless identified by Mr. Edwards himself.

The only information I can get about them from America is that the types are in Mr. Edwards' collection, and that they are elsewhere not to be met with at present. What would American naturalists think of it if I published descriptions of forms which existed in my collection alone, in such a paper as *Land and Water*? Would not they be quite right to ignore them? I say yes, without hesitation.

The number of scientific journals is now so great, and some authors seem to take so much pleasure in scattering their descriptions broadcast that unless some stringent rule is laid down to check the present practice it will be impossible to work at all without a public library of reference at hand, and even there the number of books one must have on the table at once is incredible. All this trouble might be avoided if a rule was made that only certain specified publications should be recognized as the medium for describing new species, and that the descriptions must either be accompanied by a figure, or give specific characters, by which the species could be certainly recognized. Without this, descriptions of nearly allied forms of *Colias*, *Argynnis*, *Lycæna*, and many other genera are practically useless. Compare Mr. Stretch's remarks on the genus *Arctia*. *Papilio*, vol. II., page 90.

Mr. Edwards says on page 60 that in all his experience of breeding butterflies from the egg, whilst what many had supposed to be mere varieties had often turned out distinct species, yet he does not recollect one instance where the reverse had taken place, and a form which he had supposed on the strength of the imago only to be a species had turned out by breeding to be a variety only.

I will leave it to others to say how far this coincides with their experience, but will call attention to a passage in Dr. Rossler's *Lepidoptera* of Wiesbaden, 1881, pp. 87-88, in which, speaking of *Agrotis tritici*, he says that out of the great number of specimens of this species which he raised in 1871-72, the following plates in Hubner's & Herrich Schaffer's works were all richly represented:

Hubner.—*A. fumosa* 153. *A. aquilina* 135. *A. obilisca* 123.
A. fictilis 479 and 710. *A. unicolor* 544. *A. eruta* 623. *A.*

carbonea 700. *A. praticola* 567. *A. vitta* and *A. aquiliana* 533-53. *A. ruris* 416.

Herrich Schaffer.—*A. adumbrata* 121. *A. rustica* 495. *A. formosa* 526. *A. tritici* 527-52. *A. obelisca* 529-53.

Of these are 15 forms which were supposed by two of the highest authorities on European lepidoptera to be good species and which are arranged as follows by Dr. Staudinger:

A. nigricans Linn = *fumosa* Hb. 153 = *rustica* H. S. 526 = *carbonea* Hb. 700, var. *lubricans* Esp. = *rustica* Hs. 495.

A. tritici Linn, H.S. 104 529-30 = var. *vitta* H.S. 103 527-8; var. *eruta* 4 Hb. 623 = *tritici* H.S. 527-8; var. *aquilina* Hb. 135 — *fictilis* Hb. 79 — *praticola* Hb. 567.

A. vitta Hb. 533-4.

A. obelisca Hb. 123; H. S. 103 529-30; ab. *ruris* Hb. 416; var. *Villersii* Gn. — *obelisca* H. S. 532 — *fictilis* Hb. 710.

A. adumbrata Ev. H. S. 121.

thus reducing the 15 supposed species to 5; every one was according to Dr. Rossler (who, no doubt, has the specimens to prove his statement), not only bred in one season in one locality, but so much united by transition forms, that to use his own words "it cannot be otherwise than that they all belong to one and the same species."

As this species occurs in North America, and is no doubt just as likely to vary there as in Europe, the synonymy of the former will be a pretty little amusement for a future generation of naturalists, and I have no doubt they will not bless their predecessors; but how would the case have stood if instead of publishing good figures, as Hubner and Herrich Schaffer did, only descriptions had been given. To ignore the names would have been the only safe course, and I feel sure that many names already given, if not identified during the life of their authors and with their help, will certainly be ignored by their successors.

As to Mr. Butler's remarks about *Terias*, he no doubt feels hurt that his Japanese species, which may be judged of from the plate in *Trans. Ent. Soc. Lond.*, 1882, p. 197-9, should be so soon attacked by the only man really able to do so at present, namely, Mr. Pryer; but how much better would it have been for him and others if he had adhered to the principles expressed by himself in his *Revision of the Genera of Pierinæ* *Proc. Zool. Soc.*, London, 1881, page 526, where he says, in speaking of *Terias*, "I shall not therefore increase the difficulty of determining the already numerous and nearly allied species by describing all the unnamed forms at my disposal, but shall rather strive to lighten the labors of my fellow-workers by clearing up to the best of my ability the somewhat confused synonymy already existing."

In conclusion I must say that I look forward with the greatest interest to Dr. Hagen's promised remarks on the species of *Colias* and other genera, and beg to assure him that however much hostile criticism he may draw from some persons, he will deserve the hearty thanks of all who, like myself, are anxious to see the study of Lepidoptera put on

a more scientific footing and a check put on the practise which is so prevalent in certain quarters of describing at random every thing which seems to show variation.

I repeat what I said in my paper on butterflies of China and Japan in Proc. Zool. Soc., London, 1881, p. 857, "that the time was gone by when species could be described wholesale without comparison with a series of all the allied forms in neighboring regions."

NEW SPECIES OF ÆGERIADÆ.

BY HENRY EDWARDS.

✓ SCIAPTERON PRÆCEDENS. n. sp.

Allied to *S. polistiformis*, Harris, but narrower in the wings, smaller, and of different coloration. Antennæ, brownish orange, black at the tips. Head and thorax black, with some red scales. The tegulæ are bright reddish brown. Abdom., glossy black, with some red scales laterally at base. Three anal segments and caudal tuft bright lemon yellow. Fore wings brown, with a basal vitreous streak, stained along the internal margin with dull red. Hind wings vitreous at their base, the vitreous space a little larger than in *S. polistiformis*. Beneath, both wings are streaked with red and yellow. The femora are reddish, tibiæ black, hind tarsi lemon yellow.

Exp. of wing, 30 mm. Length of body, 14 mm.

1. ♀ N. Carolina. Coll. B. Neumoegen.

The yellow tip to the abdomen will at once serve to distinguish the species.

ÆGERIA BOLTERI. n. sp.

Size of *Æg. fulvipes*, Harris. Palpi, deep orange. Thorax, head, antennæ and abdomen, brassy brown, the latter with a very broad belt of fiery copper-red around 5th and 6th segments. Hind tibiæ and tarsi brownish, the latter silvery white within. Fore wings with margin very narrow purplish black. The discal mark also purplish black, edged posteriorly with golden orange. The opaque space is wholly golden orange, with purple streaks. Caudal tuft, brown black.

1. ♂ N. Illinois. Collected by my friend, Mr. A. Bolter, to whom I dedicate the species. Type. Coll. Hy. Edwards.

ÆGERIA ÆMULA. n. sp.

Very like *Æg. tipuliformis*, L., but much smaller and slenderer in all its parts. Palpi, sides of the thorax beneath, coxæ, and anterior legs pale lemon yellow. Posterior legs banded with bluish black. Thorax above bluish black, with narrow pale lemon yellow lateral stripes. Abdomen, bluish black, with four narrow bands of pale lemon color. Caudal tuft bluish black above and beneath; lemon yellow at the sides. Fore wings, with the opaque portions narrower than in *Æg-*

tipuliformis, but of the same color. The fringes of both wings are also much narrower than in the common species, and of less coppery hue. The species has the appearance, however, of a much dwarfed form of *Æg. tipuliformis*. It may possibly be *Æg. scitula*, Harris, but it does not agree with his description, and in the absence of his type for comparison, I am not able positively to decide the question.

Exp. ♂ 8 mm. ♀ 10 mm.

Types. Coll. Prof. C. V. Riley.

PYRRHOTÆNIA WITTFELDII. n. sp.

Allied to *P. Floridensis*, Gr., and *P. Texana*, Hy. Edw., and apparently intermediate between them. It is the size of the latter (20 m.m.) Antennæ blue black. Head, thorax, and abdomen brownish black; the head with narrow orange band at base, and the thorax with rather broad lateral bands of the same color. The abdomen has 3d, 5th, and 7th segments rather broadly banded with orange above and below. Caudal tuft wholly brown-black. Palpi, edges of fore femora, and some bands on the hind tarsi, orange; on the rest of the legs and under surface brownish black. Fore-wings greenish black, internal margins and a dash behind the discal mark bright orange. Fringes of both wings brown-black. Beneath, the fore-wings are bright orange for the basal two-thirds, the rest brown-black, with the discal mark purplish.

2. ♂ Indian River, Florida. Dr. Wittfield.

Type. Coll. Hy. Edwards.

PYRRHOTÆNIA SUBÆREA. n. sp.

♂. Whole upper surface bronze black, except the antennæ, which have a white band about 3 m.m. from the tip. The hind wings are vitreous for about their basal third. Beneath, the palpi are white, as are also the joints of the tarsi, and on the wings at base are some faint greenish streaks.

Exp. wing, 14 mm. Length of body, 9 mm.

1 example. Arizona. Coll. B. Neumoegen.

PYRRHOTÆNIA ANIMOSA. n. sp.

♂ Brassy black. Thorax with the tegulæ bright reddish orange. Abdomen, with the 3 posterior segments and the caudal tuft, reddish orange. Fore-wings, with rather wide streak of same color along internal margin. Hind wings vitreous; marginal border rather narrow. Beneath, the palpi are reddish orange; tibiæ and tarsi brassy black. The streak along internal margin of fore-wing is here dull yellow.

Exp. wings, 17 mm. L. body, 11 mm.

♀ Hind wings entirely opaque. The 3 anal segments of the abdomen are reddish orange only at the sides. In all other respects resembling ♂.

Exp. wings, 20 mm. L. body, 12 mm.

4 ♂. 2 ♀. Arizona. Coll. B. Neumoegen and G. H. French.

✓ *PYRRHOTÆNIA GELIFORMIS*. Walker.

(*Egeria geliformis*), B. M. Cat. P. 8.

Head, antennæ, thorax and basal joint of abdomen brassy black, the head with a few bluish scales at the base. Fore wings wholly opaque, greenish black, with bright metallic reflection, becoming more golden at the margins. Hind wings transparent, with greenish black margin, widest at the apices. Fringes, broad golden brown. The abdomen, except the basal segment is bright coppery red; the caudal tuft slightly stained at the sides with greenish black.

Exp. wings, 18 mm.

1 ♂ Archer Co., Florida. A. Koebele. Coll. Prof. C. V. Riley.

A very handsome species. The above description is republished, as the original by Walker appears to have been made from an imperfect specimen.

I have recently received from my kind friend, Dr. Carlos Berg, of the University Buenos Ayres, four species of the group, one of which appears to be new, and which I gratefully dedicate to the donor.

✓ *MELITTIA BERGII*. n. sp.

Palpi and fore tarsi dark orange. Antennæ, femora, tibiæ and hind tarsi bluish black. Thorax and abdomen dull black with a brassy reflection. Fore wings, opaque, dull orange, with the costa blackish, the black mark widening gradually from base to the end of cell, then narrowing to the apex. Hind wings also orange, opaque at the base, and along costa, transparent outwardly, except on the edges of the nervules. Under side the same as the upper.

Exp. wing, 37 mm. Buenos Ayres. Dr. C. Berg.

The other 3 species sent by Dr. Berg are *Egeria albicalcarata*, Burm, *Melittia cyanifera*, Burm, and *Melittia ceto*, Westwood. I have also received an example of the last named species from Mr. W. Schaus, Jr., taken by him near Jalapa, Mexico.

NOTES UPON A SMALL COLLECTION OF BUTTERFLIES,
MADE IN JUDITH MTNS., MONTANA, IN 1883, BY WM.
M. COURTIS, M. E.

BY W. H. EDWARDS.

THIS collection was made by my correspondent, at such times as he could find leisure, which was not often, and under difficulties, having for some weeks no proper net-ring, but something extemporized out of a willow switch for the occasion. But, though it embraces no large number of species, it is interesting for the information it gives of distribution, and of the varieties of certain species. There is also one new Papilio.

1. *Papilio EURYMEDON*, Bd.
2. " *DAUNUS*. Bd. The most northern locality known to me.
3. " *NITRA*, new species, described below.
4. *Parnassius SMINTHEUS* Doubl., var. *HERMODUR*, H. Edw.

Mr. Edwards describes this form in *Papilio*, 1, 4, from a female in collection of the late Dr. James Bailey, and taken in southern Colorado. This expanded 2.3 inches. He compares it with *P. Corybas*, Fisch., from the Altai, an example of which in his collection measures 2.65 inches. These Montana examples, of both sexes, are very large, considerably beyond the average of *Smintheus* from Colorado, some males and females reaching 2.7 inches. Several of the females are very black, there being but little of the yellow-white ground left, and that principally in cells of primaries and on disks of secondaries. Others have the yellow-white over most of secondaries, and in cell and next base of primaries, but the outer half of primaries is melanic and transparent, with only a submarginal row of yellow spots on that area. The red spots are of extraordinary size. I should have taken the female for a distinct species had not the male been so like, and often undistinguishable from, the Colorado males of *Smintheus*, though, as before said, larger. Some of them have the spots orange, as in var. *Behrii*. Several of both sexes I cannot distinguish from a pair of *P. Intermedius*, sent me by Dr. Staudinger, as Menetries' species, from Siberia. These are the examples in which there is an absence of melanism, and the marginal borders of both wings are transparent. I have a ♀ of this same form, taken on Mt. Bradley, California, by Mr. James Behrens.

Mr. Courtis, at my suggestion, shut up some of the females with *Sedum*, on which *Smintheus* has been known to lay, and obtained 140 eggs, all which I have now in an ice-box, hoping to carry them through the winter, and to hatch them at the time I can get plants of *Sedum* here. Mr. Courtis says: "Most of these eggs came from females *that mated after I caught them*. The others would not lay, although I kept them shut up with several males until they nearly starved." (The first instance I remember to have heard of, in which butterflies have mated in captivity.) "The virgin females seemed to have the *end of abdomen of a light green horn*, instead of black, but after mating I noticed they turned black. I think they lay on the roots of plants, as the females always drop to the ground, climb up a stalk and fly away. Those in confinement climbed sticks and window frames, laying eggs as they went. They curved their bodies round and put an egg on whatever they touched *except the Sedum*. I made one lay on it by keeping her moving from one piece to another, but she seemed much excited, and as soon as I put her on grass and sticks she laid every few minutes." In a later letter, 5th Aug., Mr. Courtis writes: "I noticed a female *Parnassius* alight on a piece of *Sedum*, drop to the ground, climb up and lay an egg either in the leaves or the roots or on the ground. I could not find the egg, and yet I saw her go through the motion of laying. The only ones

flying round are broken, and few of these." On 4th July, Mr. Courtis had written: "A few days ago I took a walk, and saw hundreds of the *Parnassius*, and caught, 10 or 12, but they were all males except one, which was so injured that it died. To-day I went to the mountains and took 40 or 50, and have several of them tied up in netting with *Sedum*. *One pair have mated*, so that I hope to send you some eggs. The season is very short. I think all the butterflies come at one time, like the flowers. Spring and fall flowers are only a week or two apart here. The females of these *Parnassius* are much harder to find than the males, as they are hid in the grass." On July 8th: "I went out this morning and took 20 or more pairs, and watched the females. They all seem to fly to the ground, and either lay on the ground or in the grass roots. I could not find the eggs, though I saw them drop them somewhere among the dry sticks. I have a large number now tied up, but they will not lay. Some which were tied up, on being let loose, laid at once on grass and anywhere. This species is very common, hundreds of it on every hill-side." Again: "The *Parnassius* come about 1st July, and now, 28th July, have almost entirely disappeared. The *Sedum* is the most common flower on the rocky hills."

Mr. Mead, in 1878, when in California and Nevada, obtained numbers of eggs of *P. Baldur* and of *Smintheus*, by shutting the females up with *Sedum*. On three several occasions I have had caterpillars of one or other of these species hatch here at Coalburgh, in last days of winter, but have lost all of them. They were supplied with *Sedum* leaves, but refused to eat. I thought they might require the flowers when first hatched, and shall endeavor to retard the hatching of the eggs I now have till I can give them *Sedum* in flower. But G. M. Mollinger writes me that the eggs of *P. Apollo*, in Switzerland, hatch late in the fall, and the young larvae hibernate; awaking in early spring, and eating the leaves of *Sedum*, not the flowers. It is certain however that our species do not hatch till spring, the eggs hibernating. Both Mr. Mead and myself have carried the eggs into mid-winter, or through the winter, with no artificial retardation. It is probable that the larvae come forth as soon as the snow melts, feed on *Sedum*, and mature about middle of June, then remaining in pupae till early in July.* The newly hatched larvae are singular creatures, bearing no resemblance to any members of the Papilionidae which I have ever seen. They are thickly studded with small tubercles in rows, and each of these gives out several short curved black hairs. They look something like caterpillars of *Argynnis* but are very different from these also. I do not think, judging from the egg and young larva, as I know them, and by the mature larva and chrysalis, as figured in books, that *Parnassius* has any right among the Papilionidae. Under a system in which the preparatory stages were considered, and in the future we shall have to come to that, it would stand a long way from the Papilionidae. The

*See But., N. A., vol I, for Mr. Mead's remarks on habits of *Smintheus*, as observed in Colorado, in 1871. I also quote remarks by Schaeffer, who believed the larvae of *Apollo* hatched in the Spring. Also authors on the pouch at end of abdomen of female. Von Siebold thinks it must be formed during copulation; Schaeffer says it was on all the females bred by him.

egg of *Smintheus* is like *Lycaena*, of *Baldur* like *Chrysophanus*; the young larva like some *Nymphalidae* (and perhaps *Erycinidae*); the mature larva more like a *Heterocerous* moth (in all but the tentacles); and the chrysalis like a *Hesperian*, or also perhaps some moths. However till more is known of the biology of the genus, it may be premature to speculate on a proper arrangement.

5. ANTHOCHARIS JULIA, Edw.
6. PIERIS OCCIDENTALIS, Reak.
7. COLIAS EURYTHEME, Bd.
8. " EDWARDSII, Behr.
9. " SCUDDERII, Reak.

10. ASTRÆA, Edw. This species was described from a rubbed or broken male brought in by the Hayden Expn.; from the Yellowstone region, a dozen years ago, and till now I have seen but one or two others, from same region. But Mr. Curtis took 4 good males. The upper side in fresh examples orange ochraceous. The under side shows that this species belongs to the *Alexandra* group, the discal spot of secondaries being white (pearly) without a ring, but with slight rosy edging; also there are no submarginal brown spots to either wing, and no patch at outer angle of secondaries,—all which points are also characteristic of *Alexandra*.

II. COLIAS HAGENII, new species.

This form is very common in the Rocky Mountains from Colorado to B. Am., and is between *Philodice* and *Eurytheme*. Mr. Mead brought it in 1871, and agreed with me at the time that it could not be *Philodice*; but till this year there has been no opportunity to get at the preparatory stages, the only test where closely allied forms are in doubt. Mr. H. W. Nash, of Pueblo, Col., early in the summer, sent me some chrysalids of this species, and I noticed that the dorsum was marked by two longitudinal yellow lines, which seemed to indicate similar lines in the larva, and which are not present in the chrysalis of *Philodice*. I wrote to Mr. Nash to observe as to that, and he soon replied that the larvae he then had on hand did show sub-dorsal lines (such as are characteristic of many larvae of *C. Eurytheme*.) Great numbers of eggs were sent me again and again by Mr. Nash, during July and August, but in crossing the heated plains they lost their vitality, and soon after I received them, collapsed without hatching. Also, several shipments of larvæ were destroyed by same cause. But since middle September eggs were sent which hatched en route, and I now have about a dozen larvae just past the second moult. These will probably hibernate before reaching another moult. But Mr. Nash has made observations on the ground at my request, and has sent me larvae in alcohol, showing broad sub-dorsal bands, which, he states, had, in life, *red running through them*. In the alcoholic specimens the red has passed away, but the white bands are distinct as ever. Other larvae were sent showing white lines only, and Mr. Nash says

no red was present in these. Still others have no trace of a sub-dorsal band, and are like *Philodice*. The same variation appears in *Eurytheme* larvae, as may be seen by reference to the plate of that species, in vol. 2, But. N. A., where larvae, banded and not banded, stand side by side. Some *Eurytheme* also have sub-dorsal lines instead of bands, without red. But, in *Eurytheme*, the red is not within the band, but over it in broken bits, and under the bands are often black points. All *Colias* larvae are very much alike, being uni-colored and the longitudinal bands, when present, afford the best possible characters for distinguishing the species. *Philodice* I have often bred from the egg, and I raised two broods of larvae this summer, and no example has ever shown a sub-dorsal band or line. From banded larvae Mr. Nash obtained chrysalids, which were sent me, and gave butterflies here, *Hagenii*. Mr. Nash says, August 21: "I send you 4 larvae of the *Colias*. Three of them have a sub-dorsal line, the other has none. Out of 24 nearly full-grown larvae that I have, 14 have the sub-dorsal line." Again; "I send you a chrysalis from the caterpillar I wrote you of, as having a sub-dorsal stripe of white and red. It changed yesterday." All these chrysalids, from caterpillars with and without sub-dorsal bands, I received, and they gave imagos, all same species, *C. Hagenii*. Again, Mr. Nash writes, 24th August: "I have two larvae about to pass 4th moult that have the sub-dorsal bands very distinctly marked." On 28th: "I send one of the larva of which I wrote you, in alcohol, past 4th moult, with wide sub-dorsal lines and red running through them; the other is marked in same way, except that the lines are not quite so wide. I will send the chrysalis in a few days." This chrysalis was received and produced *Hagenii*. I give below a description of this species:

12 ARGYNNIS LETO Behr.

13 " APHRODITE Fab.

14 " CORONIS Behr. This species flies from southern California to B. Am.

15 " EDWARDSII Reak.

16 " EURYNOME Edw.

17 " var. ERINNA Edw.

18 " MONTICOLA Behr.

19 MELITAEA PALLA, Bd.

" HOFFMANNI, Behr.

20 PHYCIODES THAROS Drury.

21 VANESSA ANTIOPA Linn.

22 GRAPTA SATYRUS Edw.

23 " ZEPHYRUS Edw.

24 " SILENUS Edw.

25 LIMENITIS WEIDEMEYERII Edw.

26 SATYRUS NEPHELE, var. OLYMPUS Edw.

27 COENONYMPHA OCHRACEA Edw.

- 28 *EREBIA EPIPSODEA* Butler.
 29 *CHRYSOPHANUS MARIPOSA* Reak.
 30 " *HELLOIDES* Bd.
 31 *LYCAENA PHILEROS* Bd.
 32 " *SAEPIOLUS* Bd.
 33 " *ACMON* Doubl.
 34 " *LYCEA* Edw.

DESCRIPTIONS OF NEW SPECIES.

PAPILIO NITRA.

Belongs to the *Asterias* group, and stands next *Indra*; costal margins of primaries in both sexes much bent near apex; hind margins in both convex; tails long, narrow, tapering; *the two sexes alike in markings.*

Male.—Expands 3 inches.

Upper side black, spotted and banded with light yellow, the sub-marginal spots of primaries rounded next apex, the rest ovate; of secondaries semi-circular, the two next inner margin lunate; the discal band composed of separated spots, which are long, the upper 5 lanceolate, the others truncated, and not clearly defined on basal side; these spots resemble in shape the corresponding spots in *P. Bairdii*, but all are square-edged on outer side; on secondaries the band is also composed of separated spots, and covers about one-fourth the cell; above the incision at anal angle is a pale orange ring on yellow ground, inclosing a round, black spot; on the black ground beyond the band are loose clusters of blue scales entirely across the wing, those next inner margin scarcely more dense than elsewhere. Under side pale black, the markings repeated, pale; the extra-discal area on secondaries dusted lightly with yellow scales, and above them blue scales about a rather dense nucleus in each interspace. On the spot at outer angle is a faint tint of orange, and so also on the outer end of the two spots of the band in median interspaces; the anal ring deep orange fulvous.

Body black, the wing covers all yellow; the abdomen wholly* black, except for a slight lateral stripe; legs black; palpi black; frontal hairs black, at the sides yellow; antennae and club black.

Female.—Expands 3.3 inch.

Spotted and banded like the male, but the five upper spots of the band on primaries are sub-ovate; the yellow throughout is paler; under side without orange, except in median interspaces.

From a single pair taken in Judith Mtns. Mr. Curtis wrote me that

* In the description of *Indra*, Part VII. vol. 2. But., at bottom of first page, for "the abdomen *white* without yellow," it should read "the abdomen *wholly* without," &c.

he saw several at the same time but not knowing that they would be of any especial value, he took only the two. The species will be found abundantly in some parts of Montana, and probably in Brit. Am. It lies between *Indra* and *Brevicauda*. The latter has the abdomen marked by rows of yellow spots, subdorsal and lateral (4 in ♂ 6 in ♀), as in *Asterias*. *Nitra* has only a lateral stripe running from base of wing to last segment. *Indra* has not even all of this, but the stripe is restricted to the two segments before last. In *Indra* the spots of mesial band on hind wing are run together, and the band is square-edged on basal side; in *Nitra* the spots are widely separated, and the inner edge is not straight, and is shadowy, as in *Bairdii*. The species is very distinct. As the allied species has been named *Indra*, I call this *Nitra*, another appellation of "the Shining One."

COLIAS HAGENII.

Male.—Expands 1.5 to 2 inches.

Upper side pale sulphur yellow, sometimes with an ochraceous tint throughout; the marginal borders broad, erose within, cut nearly to outer edge by the yellow nervules; discal spots of primaries small, suboval, black; of secondaries, bright orange; fringes pale roseate, yellow about inner angle of primaries and outer of secondaries. Under side pale yellow, very slightly dusted over costal margin of primaries and all of secondaries with fine dark scales; discal spot of primaries double-convex, black, with white or yellow inside, on which are a few rosy scales; a sub-marginal series of brown points, but often none at all; discal spot of secondaries pearl-white, with a few roseate scales (sometimes the spot is all roseate), in pale ferruginous ring, sometimes duplex; at outer angle a slight patch, often a mere streak of reddish; a submarginal series of rosy or reddish points, often wholly wanting; at base a small roseate patch.

Female.—Expands from 1.6 to 2 inches.

Upper side green-yellow, more often a deep yellow, running towards ochre, and orange-ochre; of 24 examples now under view, 14 have this deep yellow hue decidedly; the marginal borders of both wings very broad, on primaries enclosing a series of large, yellow, well-defined spots, wanting in upper median interspace; on secondaries this border extends from one angle to the other, and is broad enough to nearly enclose a series of yellow spots; in others the border but partially encloses the spots, which therefore are not defined; occasionally the border is narrow (2 instances out of 24), and one example shows merely a sprinkling of black scales about outer angle. The under side is either pale yellow or greenish over secondaries and apical area of primaries, and the markings are variable as in the male. From 20 ♂ 24 ♀ from various localities, from So. Colorado to Montana and Dacotah (Bismarck).

This species is nearer to *Eurhythme* than to *Philodice*, in the imago as in the larva. The broad border of hind wing, enclosing yellow spots, is a usual feature of the former, but very rare in *Philodice*. Add

orange and *Hagenii* would be indistinguishable from *Eurytheme*. This struck Mr. Mead, when collecting in Colorado, and he wrote me then; "if there can be a yellow *Eurytheme*, this is it."

C. Hagenii is also close to *C. Eriphyle*, a common species in Br. Columbia. At the end of my description of *Eriphyle*, Tr. A. E. Soc. V. 1876, I said: "Mr. Mead brought from Colo., in 1871, a *Colias* very close to this from Lake Lahache, and which in Mr. Reakirt's paper on the But. of Colo., Pr. E. S. Phil. 1867, p. 14, is doubtless the one called *Philodice*. The same form was brought from Montana by Dr. Coues, when engaged on the Boundary Line Commission. For the present I shall give no opinion as to these, but they seem to me nearer to *Eriphyle* than to *Philodice*." The species spoken of is *Hagenii*, and I now see that it lies between *Philodice* and *Eurytheme*, the four species making a sub-group.

I name this fine species, conquered by the bows and spears of Mr. Nash and myself, in honor of our distinguished Neuropterist, whose recent zeal in a new field, to wit, the N. A. Lepidoptera, has been the admiration of all beholders. We have established it on a sure foundation by breeding from the egg, and I respectfully commend this method of determining the position of doubtful species to Dr. Hagen.

COALBURGH, W. VA., October 1, 1883.

CAPITALIZING SPECIFIC NAMES.

BY C. V. RILEY.

There could scarcely be greater justification for the inquiry on p. 62, of this volume, as to the reason for the uniform capitalizing of specific names than the temper of the answer given by Mr. Wm. H. Edwards on pp. 103-5. My question, while somewhat obscured by typographical errors, subsequently corrected, was a simple one and has not yet been satisfactorily answered. Mr. Edwards in his reply tries hard to be facetious, but instead of bringing forward any valid defense of the custom, would dispose of it by the assertion that "it is the only proper thing to do!" Let us see what are his grounds for this assertion? Mr. Edwards has not been very accurate in his quotations from my inquiry, especially in the closing paragraph, and he misapprehends my point if he supposes that I have any objections to the proper use of capitals for specific names in accordance with the well known and generally accepted rules of the Latin language, which would include all proper nouns. My objection is to the uniform use of such capitals, whether the specific name be a common one or in the adjective or genitive form. The fashion is peculiar to Lepidopterists, and I hold that it is comparatively recent and that it is improper and unjustifiable. My reasons for this belief are:

1. The rules governing the popular designation of individuals are different from those adopted for the technical designation of genera and species; for while we write "John Brown," we as invariably write

Homo sapiens. But if Mr. Edwards wishes to make the comparison he will find it more apt in "faithful Miss Smith" or "John Smith's book" than in "Miss Faith Smith."

2. Linnæus and Fabricius were rather free in their use of capitals, as in some plant and locality names in addition to proper ones; but they were by no means universal capitalizers; whereas all the latter writers whom Mr. Edwards quotes, as Kirby, Staudinger, Hewitson and Felder are modern authors. In this country Mr. Edwards stands almost alone, his only constant company being Mr. Herman Strecker, though the fashion seems to be growing, and has been followed of late by Mr. G. H. French and Mr. A. R. Grote. Mr. Edwards will have difficulty in citing any good authorities in any branch of science, much less in Zoology, who have followed, or do now follow the fashion, and I cannot recall a single entomologist—Lepidopterists excepted—who has or does. The large majority of Lepidopterists, in fact, do not, which is strange if "it is the only proper thing to do!"

No one at all familiar with scientific nomenclature, in any department of research can doubt that since Linnæus's time the tendency—always except among certain Lepidopterists—has been more and more against the free use of capitals for specific names; while the custom of writing all specific names with a small letter is rapidly gaining ground* a result due, without much doubt, to the fact which I stated, viz: that it always permits the distinguishing of the generic from the specific names in articles where either are used singly—a desideratum which no one who has followed the writings either of Mr. Edwards or of Mr. Grote will fail to appreciate. Believing that this custom has many advantages I have lately adopted it. Uniformity of termination in scientific nomenclature for equivalent divisions is desirable, and rules so far formulated have had this as one of the objects to be attained. Uniformity of beginning in generic and specific names is equally desirable.

Mr. Kirby very courteously gives the only approach to a reason for the custom which I criticize in that in lists of species "the capital initial letter catches the eye so much more readily than small letters." In lists of species where every line may be considered a new sentence, the initial capital is justifiable; though where they follow a genus, as in most lists and catalogues, a repetition of the genus is implied and the lower case letter is preferable. I can scarcely agree with Mr. Kirby and do not find *e. g.* that the recent Brooklyn List of Lepidoptera, or Mr. Grote's latest List (where capitals are uniformly used) have any advantage in perspicuity over the latter's earlier lists (where small letters are used according to the ordinary rules), or Mr. Fernald's catalogue of Tortricidæ (where small letters are uniformly used except in quotations). These last lists are in every way preferable, both for neatness and the saving of space. It is doubtful whether the prodigal capitalizers in America have been influenced by the reason Mr. Kirby urges. The fashion is rather an unconscious development of the legitimate capitalizing of so many butterfly names taken from

* It is already adopted by some Lepidopterists even, as Walsingham and Fernald.

mythological or other proper personages, coupled, perhaps, with the childish idea that the capital gives more importance to the name.

Mr. Grote's reply to my inquiry is characteristically off the point. I have never used the word "immoral" in reference to his lists. I have argued against, and spoken in general terms of the moral objection to, the custom of quoting the authority for the latest generic and specific combination for an insect, and the fact that Mr. Grote, among others, has abandoned the custom, leads me to hope and believe that he will yet abandon the habit of extravagant capitalizing, and conform to common usage among scientific men.

OBITUARY NOTICES.

JAMES SPENCER BAILEY.

This well-known and respected entomologist passed out of his earthly life on the first of July last, in Albany, N. Y., which city had for many years been his home. He was born in Bethlehem, N. Y., on the 25th of January, 1830, and was therefore only 53 years of age. He was educated chiefly in his native State, and commenced the study of medicine under Dr. John Swinburn, graduating from the Albany Medical College in 1853. Soon after this event he married Miss Fanny Keith, of Augusta, Ga., and began to practice medicine in conjunction with his brother-in-law, Dr. Thomas, at Cusseta, Ala. In 1859 he went to Mobile, and very soon afterwards to Hempstead, Texas, where he spent a number of the most active years of his professional life. During the war he served for over a year as a surgeon in the Confederate army, returning to Albany at the close of the close of the strife, and remaining there until his death. In 1869, he had conferred upon him the honorary degree of Doctor of Medicine, by Soule University, of Galveston, and in 1874, he was honored by Hamilton College with the degree of Master of Arts. He was also chosen President of the Albany Medical Society, and was long one of the chief editors and compilers of the transactions of that body. He was widely interested in all subjects appertaining to Natural History, and many papers from his pen, on various interesting questions are to be found in "Forest and Stream," the "Country Gentleman," and other journals, while his articles on matters relating to his own profession are numerous and well-written. As an entomologist, he was chiefly known by his excellent articles on *Cossus Centrens* and *Ægeria pictipes*. His collection, principally of Sphingidæ and Catocalæ was extensive, and probably second to few in this country. He possessed a rare enthusiasm for his favorite science, and to use the words of one of his biographers, "he had a mind above the question of money-getting, and loved to work on those things which inform the mind, and develop the orderly beauty of nature." It is most earnestly to be hoped that his various papers may be collected and published in some permanent form. The editor of the "Medical Annals," Albany, July, 1853, thus

speaks of our departed friend : "It is not a common-place man that has gone from our roll of active membership, but one who was larger than the ordinary—larger not only in mental capacity, but also in worthy ambitions, in appreciating the things that are worth living for, and in kindly regard for his fellow-men."

H. E.

TOWNEND GLOVER.

Professor Townend Glover, so long connected with the Government in the capacity of Entomologist, died at the house of his adopted daughter, Mrs. Daniel Hopper, in Baltimore, Sept. 7th, from an attack of apoplexy. His most intimate friends know comparatively little that is exact concerning his early life. He seems to have been born on the ocean near Rio Janeiro, of English parents, as near as we can find out, in the year 1813, so that at the time of his death, he had entered on his seventy-first year. From the most trustworthy statements it seems that he was taken to England, while yet a child, and received his education there and in Germany. He came to this country as a young man, and finally settled at Fishkill, on the Hudson. It was during his residence at Fishkill that he first became connected with the Patent Office, and we find his first recorded work on Entomology in the Agricultural Report for 1854. He subsequently accepted a position in the Maryland Agricultural College as lecturer on Natural History, and remained there until he was appointed Entomologist to the present Department of Agriculture in 1862.

Mr. Glover had many personal peculiarities and one of his humorous boasts was that he was born in no country and never named an insect. His early work shows him to have been an excellent observer, and some of his reports are models of careful and painstaking work. This is especially true of his reports on insects affecting the cotton plant in the United States. He was most ready with his pencil, and had a positive genius for modelling fruits and mounting birds. He was the founder of the present museum of the Department of Agriculture.

His chief work in Entomology, aside from the numerous annual reports which he prepared as Entomologist to the Department, was the preparation of a large number of copper-plate engravings (287 in all,) of insects, with an immense number of collected notes. These plates, especially the earlier ones, are admirable illustrations of most of the commoner insects of the United States, and their transformations, and it had always been his intention to issue them as a complete work on North American Entomology. They not only represent many original drawings from life, but copies of a great many figures by other authors. Thus many figures from Smith and Abbott, Boisduval and Leconte and Ratzeburg, are reproduced. In time the same insect often came to be repeated on different plates, and the work evidently grew beyond the author's anticipations when it was conceived. In the preparation of these plates he showed an enthusiasm and an industry almost phenomenal. Some of them have been published in limited editions, as "M.S. Notes from my Journal—Diptera;" also with sim-

ilar titles, the plates and notes on Hemiptera, Orthoptera, and on the Cotton Plant and its Diseases. The plates of the remaining orders have been circulated among a few of his friends, but there are but fifteen full sets in existence. The plates with the notes were purchased a year ago by the Government for \$7,500, and are now deposited in the National Museum under the care of Prof. Baird.

It is doubtful whether any entomologist will ever care to take the responsibility of editing and revising this unfinished work, but the plates and notes, just as they are, ought to be published in limited editions by the Government and distributed to educational institutions and libraries throughout the country.

C. V. R.

VICTOR TOUCEY CHAMBERS.

Entomologists will learn with deep regret of the death of V. T. Chambers, at Covington, Ky., on August 7th—his fifty-second birthday. He was a lawyer by profession, and yet found time to do a great deal of entomological work. His writings have been confined almost exclusively to the Tineidæ, and all of his earlier papers were descriptive in their character and were published mainly in the "Canadian Entomologist."

His later writings, published in "Psyche" and the "Cincinnati Quarterly Journal of Science," dealt largely with the larval structure of the Tineidæ. In addition to these various articles, he published in Bulletin 1, Vol. IV., of the United States Geological and Geographical Survey, a list of "Tineina and their food-plants" and an "Index to the described Tineina of the United States." His collection was some years ago deposited with the Cambridge Museum of Comparative Zoology, and duplicates of many of his types are in the possession of private individuals.—*From American Naturalist.*

JNO. L. LECONTE, M.D.

This distinguished entomologist, and most estimable man, died at his residence in Philadelphia, Nov. 18, 1883, at the comparatively early age of 58 years. In him the world has lost an earnest devotee of science, and those who knew him best, a warm-hearted, affectionate and sympathizing friend. He commenced the study of natural history while little more than a boy, his taste for such pursuits being encouragingly fostered by his father—himself a distinguished naturalist—and the collaborator with the late Dr. Boisduval in the "Lepidoptera of North America." Many other members of his family are of great eminence in the scientific world, two of his cousins, Drs. Jno. and Jos Leconte (the latter a well-known geologist,) holding high positions in the University of California. Dr. J. L. Leconte, whose death we have now to deplore, made a special study of the Coleoptera of this country, and his writings upon his favorite branch of entomology, are both numerous and valuable. A full list of them, numbering over 150 papers, was published about four years ago by "Psyche," and more recently by the Bull. Brooklyn Ent. Soc. It has been suggested that the whole of these papers, many of them now exceedingly scarce, should

be collected and republished in a permanent form. Such a work would be hailed with joy by entomologists throughout the world. It is understood that Dr. Leconte's magnificent collection of Coleoptera, so precious for the number of types it contains, has been bequeathed by him to the Museum of Comparative Zoology at Cambridge. The many who loved him and sorrow for his loss, may find consolation in the spectacle which he presents of a life well rounded, without reproach, honest, true and generous in all its details, and filled with devotion to whatever end was before him, of one who lived his allotted time without an enemy, and who passes to his rest with the affectionate regret of many grateful and loving friends.

H. E.

COMMENTS ON A PAPER ENTITLED "THE GENUS COLIAS,"
FROM PROC. BOST. SOC., N. H., VOL. XXII.

BY W. H. EDWARDS.

In Papilio III, March, 1883, I replied to Dr. Hagen's first paper, "Portion of a preliminary report on the Butterflies of Washn. Terr.," and proved that he was altogether at fault with regard to *P. Zolicaon* and *Oregonia*; that they were not varieties of *P. Machaon* or of each other, and that *Zolicaon* did not even belong to the same sub-group with *Machaon*. I had said enough about the distinctness of *P. Rutulus* from *P. Turnus*, also claimed by Dr. Hagen to be varieties of one species, in a previous paper, which appeared in the January No. of same volume of Papilio, and am prepared to-day to demonstrate from the larval stages that these two species are distinct, as I have bred larvæ of *Rutulus* from the egg on a pretty large scale the past summer. But as I shall devote two Plates in Part XII. But. N. A. to *Rutulus*, I need say nothing here of that species.

The argument in this *Colias* paper follows the same line as that laid down in the *Machaon* paper spoken of; namely, that where two or more forms, called species by some authors, show resemblances, where one or more characters are common to them all, these so-called species are really but one species. Whether each is permanent to-day, breeding true to its own type, so far as there is knowledge of it, wholly dissevered from its next ally in the series, does not enter into the estimate. Whether there are larval differences is a matter of no consequence; if there is resemblance, it shows not community of origin, that being ignored altogether, but derivation. One of these forms is assumed to be derived from the other, and if there be several, all are derived from one. The derivation can in no instance be proved, and in some cases presupposes a state of things which not only does not exist, but in all probability never can have existed. All the same, resemblance is identity. In this way, what other naturalists call a sub-group, a group or a genus, resolves itself into one species and its de-

rived forms; and the parent form is the one which happened to be first described in the books.

Now, I undertake to say that this mode of treating species, though it might have answered fifty years ago, is not satisfactory to-day. The vast majority of naturalists see in resemblance not necessarily identity, but community of origin; they hold that all the species of the same genus are descended from the same progenitor; that intermediate forms between strong varieties descended from a common progenitor tend to become extinct, being absorbed by the stronger forms; that permanence and breeding true to type are proper characters by which to determine what is a species; that species inheriting nearly the same constitution from a common parent, and exposed to similar influences, naturally tend to produce analogous variations; or that the same species may occasionally revert to some of the characters of their ancient progenitors. That is the teaching of Darwin, and to refuse to admit it is as if one should refuse to admit the truths taught by Copernicus.

Every person interested in these questions should read the address by Dr. Asa Gray, "on Sequoia," published in his volume of addresses and essays, entitled "Darwiniana" (Appletons, 1876). In this it is shown how distinct genera of plants are represented by closely allied species, perhaps in very small numbers, in widely distant parts of two continents. In one genus mentioned there are three species only, one of which is found in Florida, one in California, one in Japan. In another, four species inhabit Atlantic N. America, California and China. In another case, the single species of a genus, inhabiting a limited district of the Alleghanies, "finds its only and very near relative" in a single species of another genus in Mantchooria. I do not find, by the way, that Dr. Gray gives these related forms any lesser rank than species. On the Hagenian system, in each case the allied species would be looked on as so many derived forms, derived one from the other, and as Dr. Gray shows farther on, this would be impossible. His explanation is as follows: In remote geological ages the circumpolar regions had a warm climate; vegetation was very like what it is to-day in the temperate zones of both continents. This is proved by the fossil trees and plants which are preserved in the present arctic regions, with characters so distinctly marked as to be capable of identification. The conclusion of Lesquereux, quoted by Dr. Gray, is, that the essential types of our actual flora are marked in the cretaceous period, and have come to us without notable changes through the tertiary formations of our continent. And Dr. Gray says for himself: "I, for one, cannot doubt that the present existing species are lineal successors of those that garnished the earth in the old time before them. The glaciation of the north temperate zone, following the warmer period, pushed the species southward, upon widely different longitudes. Hence the diffusion of the same species over two continents." And he adds, that "this hypothesis supposes a gradual modification in different directions, under altering conditions, at least to the extent of producing varieties, sub-species and representative species, as they may be variously regarded."

Now this applies to butterflies as well as to plants, and I propose to

apply it to a very interesting group, which shall embrace, of the new world species, *Philodice*, *Eriphyle*, *Hagenii* and *Eurytheme*; in the old world, *Chrysotheme*. Other species may be, and no doubt are, in direct descent from the common progenitor of the five, but these form so compact a sub-group that they may be studied by themselves to advantage. In one continent, *Chrysotheme* represents the ancient species; in the other continent, *Eurytheme*. This last presents itself in three distinct forms, or in other words, the species is tri-morphic, while *Chrysotheme* presents but a single form. It has its variations, of course, as does *Philodice*, for example, but these have not separated into defined seasonal forms. Of the three forms of *Eurytheme*, one appears in winter or early spring, according to the latitude, *Ariadne*; the second succeeds it in late spring, *Keewaydin*: and the third is the summer form, *Eurytheme*. The first is small, with a minimum of orange, and that pale; the second is larger, with orange deeper and covering a larger part of the surface; the third is very large, and the orange covers the whole surface, is intense and often iridescent. *Keewaydin* most approaches *Chrysotheme*, and Dr. Hagen assumes as a matter of course that it is *Chrysotheme*, neither more nor less, which from its territory in south eastern Europe—Austria at the nearest, has jumped over the longitudes, first to the Atlantic, then across that ocean, and popped down in the interior of the Western Continent, hundreds of miles beyond the seaboard, as if it had crossed in a balloon, and been dropped like a sand bag; here it has then taken possession of the Mississippi Valley and westward, and has in course of its American sojourn and travels, developed, the doctor says, both backward into a winter form and forward into a summer form, which he has to concede are distinct from anything seen in the territory of *Chrysotheme* at home. Neither *Chrysotheme*, nor any form of *Eurytheme*, inhabits the boreal regions of either Continent, and *Eurytheme* is scarcely known in British America, even. Therefore for one to have been derived from the other, or for the two to be the same thing, as I said before, presupposes impossible conditions, and is simply preposterous. The reasonable explanation of the resemblance between the two species is this: the common progenitor of both inhabited the circumpolar regions, and by the glacial climate, which followed the temperate, was pushed southward, one branch on one continent, the other on the other continent, and for all the ages that have passed since the parting, no possible connection can have been between the two. Now what is the latest date at which such a parting could have been possible? It must, of course, have been when North America and Europe were connected through the polar regions, and the leading geologists assure us that this occurred during the last glacial period, and that before the close of it, the connection was broken, and finally. The close of the glacial period is set down at 80,000 years ago, its beginning at 240,000, and in the intervening ages all this southward migration of plants and insects took place. And what is the state of things to-day as regards these Coliads? We find *Chrysotheme*, the present representative of the ancient species on one continent, a very constant species, and entirely without defined seasonal forms; we find

three forms well-defined going to make up the present American representative of the ancient species. There is resemblance between *Chrysotheme* and one of the forms of *Eurytheme*, but not more than there is between *Philodice* and *Eurytheme*, save in the single character of color. If *Chrysotheme* on a large scale could be introduced to day to America, it would breed true to its own type, and be a constant species just as it is in Europe. It would be ages before it would vary largely and could part into defined forms, and these might vary much from the forms under which we know *Eurytheme*. The only rational explanation is that of community of origin, and in both continents modification has taken place, resulting in well-separated species. Each is true to its own type, has marked peculiarities, and is permanent; and therefore is a species; and the two are species.*

Carrying this explanation a step farther: not only have those two orange species sprung from one ancient species, but the three others before named have come from the same source.† Of these, *Eriphyle* has possession of the Pacific Coast towards the Rocky Mountains, and at least as far south as the United States boundary line; *Hagenii* occupies the Rocky Mountain region from southern Colorado well into British America, and to the east as far as the desert country; *Philodice* inhabits the Atlantic and Gulf States, part of the Mississippi Valley, and part of Canada, but there is no evidence that it has yet crossed the desert belt to the west, or anywhere

*Dr. Staudinger, in his Cat. 1871, gives the location of *Chrysotheme* as follows: Eastern Middle Europe, Asia Minor, Armenia, Middle and Eastern Siberia. I wrote Mr. A. G. Butler for any information he could give me. He says, "I strongly suspect it to be a strictly European species. The B. Museum contains examples from Germany only." I also wrote Dr. Staudinger, and he replies, 8th Oct., 1883; "In all the collections I have received in the last ten years from Central and North Asia there never was one *Chrysotheme*. I have only one specimen from East Siberia in my collection, but this was in the large Hopffer collection which I bought. I have received *Chrysotheme* only from Southeast Europe. I never met or received it from Asia Minor. *Chrysotheme* varies, and the first generation is always somewhat different from the second. I received from Lapland some *C. Hecla*, very near to *Chrysotheme*, and it may be the former is the northern form of that species. Also your *Keewaydin* is hardly to be distinguished from *Chrysotheme*, and I have also from your very variable N. Am. species, *Eurytheme*, specimens which are hardly to be distinguished. Perhaps all are from the same species, not connected by Siberia and Japan, but by the Polar regions, from the time when America and Europe were connected by land." The last suggestion is in accordance with what I have written in this paper, and is the proper one. I notice that neither Staudinger nor Zeller claim identity between *Chrysotheme* and *Keewaydin*. Staudinger says the former can "hardly be distinguished" from the latter, implying a difference. Zeller says, "I myself have taken a male (*Chrysotheme*) at Vienna with so little orange on the inner half of the wing that a North American could scarcely distinguish it among a number of male *Keewaydin*," and adds: "If *Keewaydin* and *Chrysotheme* are really the same species, we may well say that species vary much more in North America than in Europe." Ent. Zeit, 1874.

† It is my opinion that most, if not all, of the present species of *Colias*, in N. Am., must be more closely related to *Eurytheme* than *Chrysotheme* can be, having probably diverged in successive steps from the glacial form since the parting of the American and European branches. Any resemblance between *Chrysotheme* and *Eurytheme* now would be owing to both having retained some features of the ancient form. All the yellow species of *Colias* seem to have a tendency to orange spots, and I infer that the ancestral species was orange.

yet reached the Rocky Mountains. It is advancing with cultivation, and the spreading of the plant it feeds on, red clover, as I described in the text of this species, *But. N. A.*, Vol. II. These three differ from their orange allies in color, all being yellow; but they differ among themselves in the hue of yellow. The nearest to *Eurytheme* is *Hagenii*, the next is *Philodice*, and *Eriphyle* stands most remote. That some *Philodice* are like some *Eurytheme* in all respects (in one or several forms,) except color, is apparent to every one who is familiar with the two species. I spoke of it in my text of *Eurytheme*, Part V. Vol. II., *But. N. A.*, and Dr. Hagen quotes me approvingly; "he comes to the conclusion that both species have exactly the same variations and only differ in color." Also, "the larvæ are scarcely, if at all, distinguishable in the earlier stages, and in the later, are often just as much alike.* But in the later larval stages there is a conspicuous difference between *Eurytheme* and *Philodice*, the former having caterpillars, which after the middle of the stage following the second moult, have developed a series of sub-dorsal bands, as thus: on either side, on verge of dorsum, a central white band, sometimes complete and continuous, sometimes macular; over this, a red band, always macular; and under the white, a series of black dots, which may stand for a macular band. All larvæ do not show all these bands, some not having the black, some neither the black nor red, and some have no trace of any of them, and so are not distinguishable from *Philodice*, which never has a sub-dorsal band. These peculiarities are shown on my Plate. The two butterflies, starting from the same point, have developed, one into an orange species, with three distinct seasonal phases, and with a much-banded caterpillar; the other into a yellow species, without distinct seasonal phases, but very variable, and with a caterpillar in which are no traces of sub-dorsal bands.

And in *Hagenii*, we find an intermediate species of a very interesting nature. The color is yellow, lighter than is usual in *Philodice*, but varies in that respect, many being very green, and a large percentage, especially of the females are not yellow, but of a peculiar shade, a sort of buff-yellow, a shade not seen in *Philodice*. Considerably more than half the females as reported by Mr. H. W. Nash, of Pueblo, Col., who has paid great attention to this form, are of this buff yellow, and the males frequently show more or less of it, and occasionally have a flush of orange. The markings of *Hagenii* resemble those of *Eurytheme* and *Philodice*, in the discal spots, the extra discal points on both wings, the patch at outer angle, the shape of the black borders; but there is a closer resemblance in the borders of many of the females to *Eurytheme* than to *Philodice*, these being very wide, and on hind wings nearly reaching the cell, completely enclosing more or less definite yellow spots. Mr. Mead agreed with me twelve years ago, after

*The eggs of all species of *Colias* far as known, are same shape, spindle-shaped, ribbed vertically, and so alike that I doubt if any two species can be distinguished by that stage; the young larvæ and generally up to second moult, are almost or quite precisely alike also; after that, if there are larval differences, they manifest themselves in variety of bands or spots, the general shape and color remaining closely alike in all species to maturity; and the chrysalids all have same form. This shows community of descent.

passing the whole summer in Colorado collecting butterflies, that this form could not be *Philodice*, and then said, that "if there could be such a thing as a yellow *Eurytheme*, this was it." The larvæ differ from *Philodice* very much, and differ also from *Eurytheme*, in important respects. A large proportion show the sub-dorsal white and red bands, but none the black, and the white band is not macular but continuous, and *inside it, not over it*, in the continuous red line.

Eriphyle we do not know in its larval stages, but it differs from all the others in several points; it is also of a peculiar yellow, canary not sulphur nor buff; on under side reddish, and almost destitute of extra markings, often having no trace of them; is without the patch at outer angle; and the discal spot of hind wings below is pearl-white in a roseate ring. On upper side this spot is always deep orange. Dr. Hagen, p. 168, takes for his standard my description of and remarks on *Philodice*, wherein I show that the markings of that species are variable, and he claims that "all species which are characterized by differences falling in the wide range of those given in that paper "must be united with" *Philodice*.

The range of variable markings mentioned would cover nearly or quite every known species of *Colias* in one way or other. It certainly would include nearly all the characters found in *C. Eurydice* ♂; and the larva of that species in all stages is near to *Philodice*—by no means so separated as is the two-banded larva of *Hagenii*. I know this, for I have bred *Eurydice* from the egg largely the past summer. Yet this species is put by some experienced lepidopterists in a separate genus, and those who do not admit this put it in a separate group. The markings of *Eurydice* ♂ show that it sprung from the same source as did *Philodice*, though perhaps a little more remotely, and the curious "dog's head" mark common to *Eurydice* and *Cæsonia*, not unfrequently breaks out in *Eurytheme*, and occasionally a *Philodice*. This is positive proof of community of descent.

And now I should like to ask Dr. Hagen how it happens he did not "unite" *Eurytheme* with *Philodice*. He declares that it shows all the marks of *Philodice*, and in his comments on *C. Christina*, p. 163, makes light of orange as a color, because Scoresby, in 1822, found an example of *Palæno* in East Greenland which had a tint of orange! and Moschler among hundreds of *Pelidne* from Labrador, says he came across one orange example, and W. H. Edwards speaks of an orange *Philodice*. (About one example in ten thousand may have a tint.) It seems to me that my ingenious friend should unflinchingly have carried his theory to its logical conclusion, and have "united," as he calls it, *Eurytheme* and *Eurydice*, and a number of these species with *Philodice*.

At the end of the paper we are treating of the Doctor gives us a postscript to tell us that Mr. Keferstein, the well-known veteran of lepidopterologists, has published a paper on *Colias*," etc. That he gives a full classification of the *Colias* of the whole world. And lower down on the page, says of his classification, "*Eurytheme is not united with Chrysotheme*;" as I should expect from a man of such standing as Mr. Keferstein.

From this statement, any one concerned in these things can discover

that Dr. Hagen and I are looking on opposite sides of the shield. I see in all species of the same genus, in the present case, in all *Colias*, derivation from a single ancient species. In course of ages, under altering conditions, in many climates, different colonies have settled here and there throughout the broad continent; have acquired certain decided peculiarities; the intermediate links between these colonies have been lost, mostly by absorption into the strong forms; these are plainly now breeding true to their own types, and have all the characteristics of separate species.

In Dr. Hagen's view, these colonies can never separate; all the forms sprung from one original type, form, or species, must be "united with it," and altogether are neither more nor less than one species, just as the varieties of *Philodice* are all still *Philodice*. So all the many species, which, as he says, "are characterized by differences falling in the wide range" of what any given species may present "must be united with it." Even in the American *Coliades*, under the statement of his own views, the Doctor really ends by making nine distinct species, much to my astonishment. That is to say, nine centres of creation in N. America alone!

After having stated the radical difference which exists between the views held by Dr. Hagen and post-diluvian naturalists generally, in which category I include myself, it is hardly necessary to follow this *Colias* paper further. The same error runs through every page of it. But I will endeavor, as briefly as I may, to notice the Doctor's comments on certain species. The paper leads off with *C. Edwardsii*, a species described and figured by me in 1870, after the MSS. name given it by Dr. Behr, one of the acutest lepidopterists we have had in this country, in honor of Mr. Henry Edwards. It is used here as a sort of decoy for tolling nearly all other species, and passing them over to *C. Interior*. At the end of the farce it is *Interior* which gets off with the swag. At first the whole 129 examples are *Edwardsii*, in the interval between the acts they are this and that, but at the end every fellow of them is *Interior*. These 129 examples appear to comprise every *Colias* taken on this memorable foray (see page 152), and my positive friend assumes that the 83 ♂ and 46 ♀ are *Edwardsii*. That is a remarkable catch. *Edwardsii* has hitherto been one of the rarest of *Colias*, but that in any spot in W. T. it should be taken by the hundreds, in a colony apart from any other species, is wonderful!

Some of these *Edwardsii*, however, our author says, he cannot distinguish from *Alexandra*, some from this species some from that. *Alexandra* was described in 1863 and figured in 1868. Both these species stand in same volume of B. N. A., and if, as the doctor says, "*Alexandra* and *Edwardsii* belong to one and the same species," I do not see how he knew which was one and which the other, out of his 129 examples, and why *Alexandra*, as the eldest, did not capture the other. The two species at all events are closely related, and I should not be at all surprised if breeding hereafter shows that they are forms of one species, perhaps seasonal. So far, however, we have no knowledge except what may be got from the dried insects. The under side of *Alexandra* is of a delicate gray-green, and the discal spot

is small and white without a ring, the fringe of upper side is yellow. In my volume 1, I will allow that this species has had less than justice. The sexes are both too small, and the upper side of wing of the female is crooked in the printing. One of my copies of this volume, the original edition, has yellow fringes, the other a later imprint of H. M., & Co., by mistake of the colorist, has roseate, which is wrong. It is an oversight I much regret, and I would willingly have the plate re-drawn and re-colored at my own expense, and call in defective copies, if that were possible. But the species is now so well known, and so common in collections, that the defects of this plate are of less importance than otherwise they would be. The description should in this case be followed where the figure varies from it.

The typical *Edwardsii* has an orange discal spot on hind wings of female. In both sexes this spot below is in a rosy ring; there is a small rosy patch at base; a much more decided border to upper forewing, and more extended, than appears in *Alexandra*. I never have seen an example of either sex of either of these species in which there was a trace of submarginal spots on under side. It is a point in both species that they do not have these. Now, Dr. Hagen tells us that 7 of these 129 *Edwardsii* have more or less of these submarginal spots. The distinctive marks of that species are well shown in the Plate, but the fringes of the male should be yellow as the text declares; those of the female are correct, being rosy. It is possible, as before said, that these species may prove to be seasonally dimorphic. But nothing can determine that before one or both are bred from eggs laid by females in confinement. And till that happens, I shall regard them as distinct.

I doubt exceedingly whether my puzzled friend is really talking about *Edwardsii*. From his insisting that *Alexandra* is *Edwardsii*, and *Emilia* is *Edwardsii*, and *Astrea* is both *Alexandra* and *Edwardsii*, and female *Christina* is *Edwardsii*, and probably the male also is *Edwardsii*, and *Harfordii* is *Edwardsii*, and *Laurentina* is *Edwardsii*, I say after this mixing up of species, how can one have any assurance to how many species these 83 ♂ and 44 ♀ put down as *Edwardsii* belong! In this obscurity I see one ray which affords a little light; "of the six couples collected in copulation, of one the male is *Philodice*, the female *Edwardsii*," p. 155. Now, there never was an example of *Philodice* seen in Oregon or within a thousand miles of it. On p. 170, we read of *Chrysomelas*, which belongs to a sub-group with *Occidentalis*, which last the Doctor puts down as one of the protean phases of *Interior*, "the species must be considered as *Philodice* till more sufficient information is at hand." On p. 174 under *Philodice*, we have as synonyms, "Northwestern forms *Eriphyle* and *Chrysomelas*." So that I am forced to conclude that the doctor found a ♂ ♀ *Chrysomelas* in cop. as was right and proper.

Colias Christina is so peculiar a species that no trained lepidopterist can look at it without seeing that as a whole it is unlike any other American species. Its male is yellow, but with great patches of bright orange, not over the surface as in *Eurytheme*, but on the disks of each wing. The female is described and figured in B. N. A., as

large, yellow, without border, the under side is exactly as in the male, except that the hue corresponds with that of the upper surface.

Dr. Hagen affects to doubt that this ♀ on the Plate belongs to the ♀ *Christina*, and in several places he makes a point of treating my determination of the sexes of a species as of little value, having "no warrant except that they arrived in the same lot." There were 3 ♂ 1 ♀ of this "lot," received from the portage of Slave River in 1862. Lepidopterists know well enough that as a rule the pattern of the under side of the two sexes in most species, and particularly in *Colias*, is identical, and mistakes of the kind spoken of can rarely happen. On p. 163, we read "I have 2 *Christina* ♀ collected in Oregon, and W. T., entirely like, the figured one." (How does the doctor know that these, which he next says are *Edwardsii*, are *Christina*?) "They were collected among the numerous *Edwardsii*, and are entirely pale without a border. As similar ones, with a faint beginning of a border were taken in cop. with *Edwardsii*, there can be no doubt that the females without border also belong to *Edwardsii*." Also, "it would certainly need a stronger proof to consider these males of *Christina* as a separate species, the more so as they are associated with an undoubtedly female of *Edwardsii*." This is a sample of the logic of this paper. The Doctor never saw a *Christina* in either sex, but the female in the Plate has no border a female *Edwardsii* with no border was taken in W. T., and because it has no border it is assumed to be *Christina*, and therefore the female *Christina* is undoubtedly an *Edwardsii*. Plates are deceiving, and resemblance is not identity. Suppose the Doctor had examined the original ♀ *Christina* which stands in my collection, and had compared it with the females of true *Edwardsii*, which I could have showed him many of!

As to the ♂ we have this lucid observation, "I have not seen *Edwardsii* with such an orange patch, but as similar varieties are recorded for *Paleno* from Greenland by Scoresby,* for *Pelidne* from Labrador by Moschler, for *Philodice* by W. H. Edwards, there is no improbability that some may exist of *Edwardsii*." I call that reading a species out of court by inuendoes, inferences and surmises. Well, in the year of grace, 1883, a host of ♂ ♀ *Christina* have been taken in British America by Capt. Geddes, and I have had the pleasure of inspecting them. And am happy to be able to assure my dubitating friend that the two sexes are really as set forth in my Plate, but that not only are there immaculate yellow females, but there are females with more or less of a border, and with more or less of orange from a delicate flush to a pretty decided hue.

And now a few words as to *Astræa*, which the Doctor sniffs at contemptuously. This was described from a damaged male taken in Yellowstone region in 1872. I afterwards had a second male from

In 1822, and a tint of orange, and no other example recorded for the sixty years following. Now, who can vouch for Scoresby, or could swear that he was not talking of *Boothii* or *Hecla* or what not? Indeed, in Ent. M. Mag. XIX., p. 42, is a communication from Dr. Hagen, dated 5th May, 1883, announcing his discovery of Scoresby's mention of this Greenland butterfly, and the Doctor suggests that what Scoresby called *Paleno* may have been *Hecla glacialis*! Just so.

same region. The two agreed in having the upper surface of a very peculiar hue, all pale ochre, with an orange tint on disks of secondaries. Under side yellow, densely dusted black over whole surface of secondaries; the discal spot, as in *Alexandra*, white without ring. Till this season I have seen no other example, so far as I remember, but in July received several males from Mt. Judith, Mont., agreeing with the type, except that being fresh the color was light ochraceous. By the immaculate under side and peculiar dorsal spot, the species is near *Alexandra*.

And here, behold, a wonder comes to light! Our Doctor says, p. 158: "I have submitted to Mr. H. Edwards a ♂ *Edwardsii*, from W.T., with similar color (to *Astræa*, and he decided that it was much like *Astræa*. Now this color was prepared purposely. When the specimen was taken it was put in a freshly-prepared cyanide bottle, &c., &c., by which the yellow color was altered to color of *Astræa* ♂."

On another occasion "I had sent Mr. W. H. Edwards a few *Colias* from the same expedition." These my ingenious friend had treated with benzine, and he naively proceeds: "that benzine changes yellow I have learned only later through experiments made for that purpose." "I made excuses for sending the specimens in bad condition, and was answered that these *Colias* were especially interesting to him."

What an escape! Surely some good angel saved me from the snares of this chemical fowler! When beguiled with cyanide I said it was very near; when tempted with benzine the other said it was very interesting! An enterprising laboratory that of the Cambridge Museum!

C. Scudderii is compared with *Occidentalis* before it is dropped into the capacious maw of the *Interior*, along with so many other good species. *Scudderii* really stands next to *Pelidne*, and is entirely distinct from *Occidentalis*, and it is not worth while to spend more words on it.

Colias Emilia is put down as identical with *Edwardsii* and *Alexandra*. I might say, which? I have never seen but the pair belonging to Dr. Behr, which I described in 1870, and since that date have not seen these. Dr. Behr was satisfied that they were a distinct species, and he is a good judge. Dr. Hagen quotes Mr. Henry Edwards as saying that the ♂ (which appears all that is left of the pair), "may be a form of *Interior*." It can't be *Edwardsii*, *Alexandra* and *Interior* all together, for they are three species, belonging to two sub-groups.

C. Harfordii. While my perplexed friend has been losing himself in the dust of his own raising, I have spent my summer in trying to learn something of several species of *Colias* by breeding them from the egg. In other words, while the Doctor has been working at the wrong end, I have done my work at the right end. Three species have I bred in part, and two from egg to imago, and one of these two is *Harfordii*, W. G. Wright of San Bernardino sent me abundance of eggs and young larvæ; the former obtained by tying females in bags over their foodplant, *Astragalus*. The female of this species is *Barbara*, H.E., but there are ♂ ♀ of the *Harfordii* type, and ♂ ♀ of the *Barbara* type. I have examples which agree precisely with the descriptions, and there are variations from that. *Barbara* is described as bright can-

ary-yellow; *Harfordii* as bright lemon-yellow. Both shades are found in both sexes. The females, some of them, have a close resemblance to the female of *Laurentina*, but, as Mr. Edwards pointed out, the marginal border is different, being pretty nearly of equal width entirely across the fore wing, whereas, in *Laurentina* the border "is apical only, and obsolete before reaching the inner margin." All my females agree with that. The discal spot in both sexes is clear white, in a brown pink ring; the spot of *Interior* is roseate; the marginal border of fore wings in ♂ *Harfordii* is equal throughout its entire length, except that it widens a little at apex, of *Interior* it is like *Pelidne* much advanced on costa, and the inner side presents from inner margin to costa a much curved arc. Some *Harfordii* and some *Barbara* are wholly without extra-discal spots on either wing; others of both have faint traces of these spots, and one ♂, which on upper side is canary-yellow, with narrow straight border, has the under side with discal spot roseate in broad pinkish ring, has large extra-discal pinkish spots on hind wings, black points on fore wings, the patch at outer angle of hind wings. Now on under side I cannot separate this ♂ from a ♂ *Hagenii*, in color or spots. So that *Harfordii* is a peculiar and very interesting species, and presents two sets of characters, allying it to *Interior*, but always with a difference, and to *Hagenii* occasionally, but there also with a difference, for I find no upper surface like *Hagenii*, only now and then an under surface. Dr. Hagen would say that part of these examples were *Edwardsii*, and therefore *Interior*, for it is necessary to make them *Edwardsii* before they can be passed over to *Interior*, and part are *Philodice*. I say that they form one distinct species, and that the resemblance to two other species is due to community of descent.

C. Occidentalis. I received 1 ♂ 2 ♀ of this species from Fort Simpson, 1862, and when Mr. Scudder drew up his description he had the male before him. Why he had not the females I do not now remember; but I see that he describes a white female only, which Dr. Hagen thinks is *Eurytheme*. He has had similar ♀ ♀ etc., etc., from this place or that. Very likely there had been similarity in some points. The normal female is yellow, and is figured in the Plate in B.N.A. The white at best is an aberration, such as is common throughout this genus. Dr. Hagen brings the species to *Interior* as usual. There is one difference between the two that is decisive: the female *Occidentalis* has a broad border to fore wings, made up of black scales disposed in such a way that it incloses a series of yellow spaces down the whole margin, and except apex, the border is of even width. The same style of border characterizes *Chrysomelas*, which I put in same sub-group. Now *Interior* never has such a border, nor does *Laurentina*. I have a long series of these two (though I regard them as one species, from north side River St. Lawrence, from N. Scotia, and Cape Breton—Mr. Scudder's types), and in all cases the border is moderately broad at apex, diminishes gradually and ends above the inner angle and incloses nothing.

Chrysomelas may be looked upon as an intensified *Occidentalis*; very large, the largest *Colias* in America out of Group 1, with very wide borders to the ♂; the borders to fore wings of female always wide

with full series of yellow patches ; often a wide border to hind wings ; the under side often deep orange, thickly-dusted grey ; the discal spot often as deep red as *Pelidne*. I have seen a large number of *Occidentalis* taken by Capt Geddes, and they keep to their type very closely, while all I have seen from California keep to the *Chrysomelas* type. So far as the dried insects show, these two are but one species. But Dr. Hagen puts one down to *Interior*, the other as a form of *Philodice*, and he is mistaken in both cases.*

C. PELIDNE BOIS. What this species is is perfectly well known. It is figured in my vol. 2. Dr. Hagen puts *Pelidne* Bd. as a variety of *Palæno* and says that "Edwards and Staudinger give *Labradorensis* etc., as a syn. of *Pelidne*, but the original types labelled by Mr. Scudder himself belong to *Palæno*" p. 172. "Dr. Staudinger says that if both (*Pelidne* and *Palæno*) fly in Labrador at same time he must consider it a proof that both are different species. But *Ariadne* and *Eurytheme* also fly together." Let us look into this a little. In the first place, I was in frequent communication with Mr. Scudder at the time he was writing his *Colias* paper, and I have now a pair of the *Palæno*, collected by Mr. Packard, sent me by Mr. Scudder, labelled *C. Palæno*. Those I accept as the type of American *Palæno*. *Pelidne* is another matter altogether, and reading over Mr. Scudder's description of *Labradorensis* the insect agrees with it. Why would Staudinger regard the two as distinct if both flew together at the same time? Because one could not be a descendant of the other, as all Labrador butterflies are single-brooded. Dr. Hagen's reply is unfortunate: *Ariadne* and *Eurytheme*, do not fly together, but one is directly descended from the other. And if there were no *Ariadne* there would be no *Eurytheme* in Texas, and *vice versa*. It takes the three forms there to make the one species. In a letter to me, dated 29 May, 1874, Dr. Staudinger says: "*C. Pelidne* Bd. and *C. Nastes* Bd. have never been taken in the north of Europe, and also not in Asia, so far as I know. All so-called *Pelidne*, which were European specimens, were only small *Palæno*. *Pelidne* Bd. should have the name given by Boisduval." These are also the published views of Mr. Möschler, as I state in part 2, vol. 2, text of *Pelidne*. Dried specimens will never settle such a question. The opinion of three so competent judges as Boisduval, Staudinger and Möschler is enough for me till the contrary is proved by breeding from the egg.

C. Chippewa (described in 1863 as *Helena*, which name was found to be pre-occupied).—This was described from 1 ♂ 1 ♀ received from Fort Simpson, on the verge of the Arctic zone. I inadvertently gave the locality as Slave Lake in my Cat. 1877. This species and *Occi-*

* Under *Occidentalis* and *Scudderii*, Dr. Hagen remarks that the silver spots in vol. 1 are changed to black spots ; also in some of the plates of *Argyunis*. My copies are unchanged, and so are some others to which I have been able to refer ; but in my own case the plates have never been subjected to the influence of coal-gas, to which I attribute the change in the silver. I purchased a copy from the effects of a subscriber, which had the plates badly discolored, as I believe, by gas, and Mrs. Bowen was able to restore all the damaged plates. Any water-colorist can repair this defect, but I cannot say whether the silver will be more permanent than at first.

dentalis were the only Coliads received from that locality, in a very large invoice of butterflies collected by Mrs. Ross. Since then I have received from the Arctic Sea two other white females, same species, and one yellow female. These three in markings agree fully with the female first seen. Dr. Hagen thinks *Palæno* from the Swiss Alps is identical with these American Arctic examples. I cannot say they are not; but something beside surmises will be required to make me convinced that they are. I only know the two from dried specimens.

Interior is another thing from either *Pelidne* or *Palæno*. They are not even near together. *Pelidne* has white females only; the under side is of a lively green, densely dusted; the discal spot is small and deep red; the upper surface is greenish-yellow. *Interior* is brighter yellow, lacking the green tint, as Mr. Scudder says; the discal spot is large, "the centre composed of silvery and pale pink scales mingled;" the underside is a more sulphur-yellow, with scattered greyish scales (almost immaculate, in fact), and it has yellow females with white aberrations. (Mr. Scudder described the white only, and had but a single specimen, as is stated.)

After all, the Doctor, having, to his own content, demolished so many species, in one case "uniting," as the word is, nine good species as one, winds up in this way: "CONCLUSIONS. The species of *Colias* found in North America are, from our actual knowledge as follows:" Actual knowledge! that is delicious.

- " 1. Chrysotheme. ✓
- 2. Philodice. ✓
- 3. Interior. ✓
- 4. Palæno. ✓
- 5. Meadii. ✓
- 6. Behrii. ✓
- 7. Hecla. ✓
- 8. Boothii. ✓
- 9. Nastes." ✓

How thankful we ought to be for this assurance. Nevertheless, I am perplexed, because the statement is directly opposed to the principle laid down on page 168, under which all this "uniting" has been done. Why did the Doctor not, on his own conditions, "unite" *Hecla*, *Meadii*, *Boothii*, and *Philodice* with *Eurytheme*; *Nastes* and *Palæno* (taking *Behrii* to be an aberrant relation of the former), with *Pelidne*, and so cut his special centres of creation down to three? And then by a grand coup "unite" them all into one? Queer conclusion from the premises laid down! My own conclusions, after studying the Report, are that the author has not displaced a single one of the N. American species of *Colias*, as enumerated in my Catalogue. If there are any cases where two species may be seasonally dimorphic forms of one, it has not been proved, and the suggestion that such relationship in one case is possible, is mine.

And as my friend closes with a quotation from Darwin, I will give a few words from an earlier philosopher and sage, to wit, Confucius:

“Permit me, my son, to tell you what is knowledge. What you are acquainted with, consider that you know it; what you do not understand, consider that you do not know it; this is knowledge.”

Dr. Hagen has incorrectly given the history of *Eurytheme*. On page 151 we are told: “The breeding of *Eurytheme* and its related forms, by the late J. Boll, in Dallas, Texas, has been the first step to a better knowledge, and to a scientific reduction of the species of *Colias*. Mr. Boll had raised *Eurytheme* through two years, 1874 and 1875, and had sent, in the summer of 1876, his paper, accompanied with numerous specimens, to Hamburg. This paper was read at the meeting of the Assn. of Naturalists, Sept. 20, and printed directly in the *Tagblatt*, etc. The excellent paper by Mr. Edwards, N. A. But., Vol. 2, was the result of similar experiments by N. Am. Lepidopterologists.

On page 168, under *Philodice*, after reproaching me for disagreeing with his views about the “numerous doctrines of the present paper,” which he had informed me of in a letter, the Doctor proceeds: “apparently he has forgotten that he persistently separated *Eurytheme Keewaydin* and *Ariadne* as different species, till the late Mr. Boll proved that all three belonged to the same species.”

I will here take the opportunity to say, with reference to this obstinate trait with which the Doctor reproaches me, that I work, and have for 20 years worked, on a consistent plan. It may be different from that of other persons, but it leads to good results. If, in my opinion—not another man’s—a form of butterfly, of which nothing is known except by the dried specimens, is distinct enough to deserve a specific name, or I may say, in the words of Prof. Richard Owen, “the differences on which the specific character are founded, are constant in individuals of both sexes, so far as observation has reached,” I give the name without hesitation. I do not relegate such a form to one of its next allies as a mere variety of it, for the reason that neither I nor any one can tell anything about it except what the dried example itself shows. It has several times happened, after further materials have come in, that I have seen occasion to change my views, and I am not at all unready to change when I see reason. But in many other cases it has turned out that the forms which I have designated as specific are but polymorphic seasonal forms of one species, as in the case of *Eurytheme*. In such a case, at least, I have been right in naming such forms as distinct species, even if I might guess at the possible connection between them. Till breeding from the egg should establish the connection, a connection could not safely be asserted. Conjecture based on field observation only cannot be tantamount to actual proof. We have an element of uncertainty always, and I want certainty. My motto is, “indefinite knowledge is definite ignorance.” What business had I to put *Ariadne* with *Eurytheme* from any knowledge we had of these two forms! Usually such polymorphic forms are fully as distinct from each other as many species which have never been doubted, as, for example, the two forms of *Grapta Comma*. In the case of *Ajax* with its 3 forms; Boisduval, a first-rate lepidopterist, named one of them *Marcellus*, as a distinct species; Felder, another first-rate authority, named another of these forms *Telamonides*, and before

naming the third one *Walshii*, I sent examples of it to Felder, and received reply that it was distinct from *Telamonides*, and a new species by itself. Now *Ajax*, in one or other of its forms, had been figured for an hundred years, and yet here were two experienced lepidopterists—Boisduval and Felder—who pronounced each of the three seasonal forms to be a distinct species. Bear in mind, all these things were done before the connection of any such forms in any species was established by breeding from the egg. That was my work, and that led the way to numbers of cases of dimorphism or polymorphism being discovered, in each of which two or more forms hitherto described as distinct species were merged into one. It takes the two or the three forms to constitute the species, and each must have its own name. *Telamonides* is not *Ajax*, nor is *Marcellus Ajax* but these and *Walshii* together make *Ajax*. I say, and have said before, that putting down everything as a variety of something else, when we know nothing of the connection, or even whether there be one, is a lazy way of working. It is not my way, at all events. I spot the new form, make it conspicuous, put it where it cannot be overlooked, and leave it to time and fuller materials to determine its position, if there is room for any doubt in the matter. Working in that way, whether I have done good work or not, I am very willing to leave to the lepidopterists who come after me to determine. That it is a very different style of work from that exhibited in the papers I am commenting on, I freely acknowledge.

I by no means wish to detract from the credit due to Mr. Boll. In the text on *Eurytheme*, I fully acknowledged all that was due to him, and I now assert that Mr. Boll never did prove the connection between these three forms, and so establish them as members of one species. He guessed at it, and happened to guess right, but he never proved it. It was Messrs. E. W. Dodge of Glencoe, Nebr., and Mr. T. E. Bean, then of Galena, Ills., who, working with me, did that thing. I had discovered in 1871 the method of inducing female butterflies to lay eggs freely, and the following years set myself at the task of unraveling the history of several species where dimorphism was probable, and one of these was *Eurytheme*. During the next years, I wrote several correspondents in the West soliciting their aid, and two of them responded zealously—to wit, Messrs. Dodge and Bean. These gentlemen followed my directions, obtained eggs, bred the larvæ, made careful notes of their observations, and sent part of the larvæ to me. In our hands the larvæ reached maturity, and their chrysalids gave the butterflies. This was all set forth in the text of *Eurytheme* referred to. Mr. Dodge sent me eleven butterflies bred from eggs laid by ♀ *Keewaydin*, of which seven were *Eurytheme*, four *Keewaydin*. Mr. Bean obtained eggs from ♀ *Eurytheme* in Sept., from which came in the winter 1876-77 sixteen *Ariadne*, or what I called var. A of that form, differing somewhat from typical *Ariadne*, which is found in Texas, but not in Illinois. Mr. Bean also bred *Eurytheme* and *Keewaydin* from *Keewaydin* eggs laid in August. This was all that could be done in Illinois. The missing link in the series was the breeding typical *Ariadne* from *Eurytheme* and *Keewaydin* from *Ariadne*. There I had to rely on what I could

learn from Mr. Boll. And what was that? I had opened a correspondence with him on the same subject late in winter '75-'76. His first letter in reply is before me (the first I ever received from him) dated 20th February, 1876, and it reads thus: "*Colias Chrysothème* is now tolerably abundant, and I intend to make a large collection of it up to the larger *Eurythème*, so that it will be very hard to determine in regard to these two species where *Chrysothème* (*Kee-way-din*) ends and *Eurythème* begins. The latter appears the latest, and I venture the conjecture that it must come from the autumn eggs (that is, from *Eurythème* eggs of the previous year) "or the first forms of *Chrysothème* emerging in the spring." (At that date Mr. Boll had not distinguished *Ariadne*, and never did till I pointed it out to him.) He continues, "the caterpillars will now soon appear upon the clover, and I hope to find a multitude of them." That shows that in February, 1876, he knew nothing of the connection, from breeding, between these forms, though he might conjecture that *Eurythème* must be the product or its own form of *Kee-way-din*, or joint *Kee-way-din* and *Ariadne*, which together he calls *Chrysothème*. Mr. Boll never obtained eggs from one of these forms, and from eggs bred the larvæ. All he did was to search the clover for caterpillars. These, of course, came from eggs laid by different females, but of what type no knowledge could be possible.

I received the next letter, written May 23, 1876, saying: "This year I have had some *Eurythème* caterpillars that look exactly like those of *Chrysothème*, and am confident that the two species are the same, the difference being owing to season." He had found larva which gave *Eurythème* butterflies, and these larvæ looked like other larvæ which had given *Kee-way-din* butterflies, is plainly the meaning there. His published paper shows that he never did obtain eggs, or caterpillars proceeding from *Eurythème*, even on the clover, so far as he knew.

On the 26th of November, 1876, the third letter: "I had worked out a letter on the dimorphism and variation of a number of N. Am. butterflies, which was presented by my agent in Europe during September, before the Assn. of Nat., and found general interest." The paper itself says nothing about having bred any of the forms from the egg, but these are the words: "From November to May, I often found caterpillars and butterflies together. The former showed no trace of difference either in color or markings, except that they were found somewhat larger in April; but the butterflies, on the contrary, differed. I caught and bred a number of the latter, No. 1-15 of the collection, from November to the end of February," etc., and he goes on to describe what is the form *Ariadne*. Afterwards, he says that 1-15 are *Ariadne*. "Nos. 16-19 were taken in March; 20-25 were taken in April; 26-31 in May; 32, 33 in the last days of June." By the paper, then, it appears that Mr. Boll found caterpillars from November to the end of February, and they gave *Ariadne* butterflies; and not a word is said of obtaining other forms, or butterflies from caterpillars, even found ones. I gave a full abstract of Mr. Boll's paper in my text, and added that his conclusions as to the existence of the three

forms and their sequence were the result of his observations in the field. "It is the opinion of Mr. Boll that the eggs laid in June do not develop, owing to lack of food, till the summer is past." He had before said that the food plant, Buffalo Clover, dies off before the last June butterflies appear, and does not revive again till the advent of the November rains, so that there was absolutely nothing for the young larvæ to feed upon. And I remarked on this: "I apprehend, if there is any retardation, it must be with the larvæ." Now, Mr. Boll never had obtained an egg from the female of form *Eurytheme* or he would not have conjectured that the egg is retarded from June to October. He would have known whether it hatched or not. In fact, the egg must hatch in three or four days, and the young larva must go into lethargy at the root of the plant, under the surface of the ground, to come up when the rains fall and the clover begins to grow.

Mr. Wright, of San Bernardino, where there is a dry season as in Texas, when green vegetation totally perishes, observed an Argynnis *Coronis* on the ground depositing eggs on the crown of a violet plant (dead at top, of course), under the surface. He sent me the eggs, and they hatched at Coalburgh in the time usual with eggs of the larger Argynnids, and the larvæ went at once into lethargy. In cold weather, or by cold applied, the hatching of butterfly eggs is retarded, but heat has the opposite effect. This shows that Mr. Boll never bred from egg of *Eurytheme*. He saw a regular series of butterflies, increasing, as he says, in size, extent, and intensity of orange as the season progressed. From caterpillars found on the clover, he got what he calls *Chrysotheme* (*Keewaydin* or *Ariadne*, it is not certain which), and in letter to me, but not in his published paper, he says these caterpillars looked exactly like other caterpillars which produced *Eurytheme*, and these also had been found on the clover. He sent me a large invoice of his captures of butterflies, indicating the date at which each one was taken, and I showed him that certain ones were *Ariadne*, certain ones *Keewaydin*, and certain ones intergrades.

So I come back to my first statement, that Mr. Boll did not "breed *Eurytheme* and its related forms" in 1874, '75, or at any time, and so "give the first step to a better knowledge, and to a scientific reduction of the species of *Colias*;" nor did he "prove that all three (forms) belong to the same species." He surmised it. Messrs. Bean and Dodge and myself proved it, not from field observations only, but actual breeding from eggs laid by females of the different forms found in Illinois and Nebraska. The eggs were obtained expressly to find out the connection, and it was found by us and no other person. The relation of the Texas *Ariadne*, which is not found in Illinois, we had to infer from analogy, and from Boll's field observations.

DESCRIPTIONS OF THE EARLY STAGES OF SOME MEXICAN LEPIDOPTERA.

BY WILLIAM SCHAUS, JR.

PAPILIO THYMERÆUS. Boisd.

Feeds on chirimoya. Length when mature, $1\frac{1}{2}$ inches; head small, slightly flattened, white, with black markings. The body is rather stout, and segments contracted. The skin is velvety in appearance, and owing to the variety of color, the larva is very handsome. Retractable tentacles red. Segments one and two are dorsally black, with numerous small turquoise blue spots, some of these having a yellow centre. Laterally these segments are white, with a small bright orange spot on each, above which is an irregular black line. Segments 2 and 3 are considerably enlarged. Segment 3 is black dorsally, with two sub-dorsal blue points placed one before the other. On either side of the anterior blue point is a large yellow spot, and again beyond this three smaller spots, two white and one blue, with orange centre. To either side of the posterior blue point are three white spots. Laterally this segment is pale blue, with three orange spots, one anteriorly and two posteriorly, and separated from one another by a black line. Segment four is very similar to the third segment, but differs in having anteriorly only two spots beyond the large yellow one, and posteriorly in having a sub-dorsal white band, which continues to 12th segment. This is edged with black, and then to either side comes another white dorsal band; beyond these comes a rather broad black band, then a dark green one, and finally a narrow black one. In the sub-dorsal white band on each segment is anteriorly a pale blue spot and posteriorly a yellow one. In the other two white dorsal bands on each segment is a central yellow spot. These last two white bands are replaced on segments ten, eleven, twelve anteriorly by a yellow spot edged with black, and posteriorly by a few pale blue spots. Laterally, beginning at fifth segment, the larva is turquoise blue, which is formed into four bands by three black lines. The blue ground color is more or less spotted with yellow and green. Prolegs and abdominal legs vermilion red, with an orange spot near base. Larva, when about to transform, fastens itself at anal segment by a silken thread passed around shoulders, and in 48 hours becomes a chrysalis. Length of latter, three-fourth to seven-eighth inch, stout, especially abdomen, but tapering to a point at anal segment. At 1st seg. the body is greatly compressed as though a string had been passed around it and then tightly pulled. On thorax is a long cylindrical protuberance. Surface slightly rough. Color, pale green, with a few brown spots on thorax, and dorsally, on segments. In the winter, the chrysalis state lasts four months, and in summer from one to two months. The butterfly is only found in the open country, and here chiefly frequents Macuiltepec, a high hill near the town, and covered with very low vegetation. It is to be found the entire year.

PAPILIO POMPEIUS.

Var. Pandion. Feld.

Length when mature, two inches. Head round, brownish green with a few small pale yellow spots. The first three segments increase rapidly in size, the third being the largest. The skin is smooth, and dorsally are two rows of small fleshy protuberances. There is also a single row of these laterally on segments one, two and three. The general color above is olive green, mottled with brown and many irregular small white lines, which give it no regular pattern. Sub-dorsally and posteriorly on each segment is a darker brown spot, which continues on to following segment, making a small dash of color on it. On segment four this brown spot has two small brown spots anteriorly to it. On segments six, ten and eleven laterally the white lines are thicker and more of a cream color. The protuberances are edged on the inner side by a minute lilac line. Prolegs yellowish. Abdominal legs are white, with three gray spots laterally, and covered with short white hairs. Underneath the color is white, except first four segments, which are greenish yellow. Larva fastens itself by tail and a silken thread around shoulders. The retractile tentacles are flesh color. Transforms in 48 hours.

Pupa.

Length, $1\frac{1}{4}$ inches. It bears the greatest resemblance to a piece of bark, being rough and mottled brown and gray, except outer half of wing cases, which is moss green. In shape it is cylindrical, truncated at top and abdominally tapering rapidly beneath from eighth segment, and forming a slight hollow. On thoracic region are also two depressions. Dorsally on segments are several spiny protuberances,

The imago emerges at end of six weeks. The first specimens out were the largest, the last out the smallest, and also differing in having more white on primaries. From 39 larvæ all emerged in good condition. This is not a rare species here, and is double brooded. Generally met with along the forest roads.

Feeds on *orange and Japote Blanco.*

AGRAULIS (JUNO) v. HUASCAMA. Reak.

Larva.

Length when mature, $1\frac{1}{2}$ inches. Very slight in build. Head black, slightly bilobed, surmounted by two small black horns. Body smooth, black, with numerous irregular reddish brown markings, which are largest on anterior portion of each segment. There are also six rows of black spines of equal length, and placed two dorsally and two laterally. On first three segments the lateral spines are wanting, but seemingly between segments one and two, and between segments two and three is a single lateral spine. The spines are slightly rough. The larva suspends itself by tail, and in about 24 hours transforms.

Chrysalis.

Length of largest, one inch. Compressed laterally and rather long,

dark brown. Dorsally two rows of rough excrescences. Thorax with sharp ridge. Head above rather flattened. Apex of wings forming a projecting curve. Antennæ covered with a series of short spiny points. *Imago* emerges in from 20 to 30 days.

A very common species at all times. *Agraulis* Moneta is also abundant, whereas *A. Vanillae* is rather rare.

COATLANTONA JANAIS. Dru.

Length when mature, one one-fourth inches. Very slight in build. Head, upper half red, lower half black, thinly covered with rather long black hairs. Body smooth. First segment red; the rest, dorsally light brown, laterally dark grey. The first segment has a lateral short black spine. The second and third segments have four spines, two dorsal and one lateral, and close to prolegs is an almost imperceptible spiny growth. The following segments to the eleventh have each seven spines, the central one being sub-dorsal, and close to abdominal legs is also a growth of short stiff hairs. Segment eleven differs in having eight spines, two being sub-dorsal, one anteriorly and one posteriorly. Segments twelve and thirteen have only two spines each, which are dorsal. The spines are longest on the second segment and are black, with deep blue reflection; they are rather thick at base, which gives them the appearance of growing from a slight wart, and are surrounded at base by a black spot, which thus forms an irregular black transverse band on each segment, to either side of this black band the ground color becomes lighter, forming like a narrow yellowish edge. The larva suspends itself by tail, and in from 24 to 26 hours becomes a chrysalis.

Chrysalis. Length, $\frac{1}{2}$ – $\frac{5}{8}$ of an inch. White, smooth, except on segments where spines of larva are replaced by a rough black point. Wing cases with marginal row of square black spots and several short black dashes. On thorax and pro-thorax are a few black marks, and tongue is also black. Chrysalis state lasts from 18-20 days.

This is the commonest *Coatlantona* found here and is especially abundant from March to October, but even in the winter months a fresh specimen is now and then seen.

ECPANTHERIA AULEA. Bdv.

Larva. Length when mature $2\frac{3}{4}$ inches.

Head small, blackish brown, shining. Body smooth dull black. Stigmata reddish brown. Segment one has a few stiff black hairs dorsally, and a lateral small tubercle from which grow stiff black hairs. Segments two and three have four dorsal and two lateral tubercles. The following segments to eleventh inclusive have each six dorsal tubercles placed thus: The two central ones are close together anteriorly, then to either side of these is one placed posteriorly, and then again one anteriorly. Laterally are two tubercles. Seg. 12 has two dorsal and a single lateral tubercle, and segment 13

has only a few bristly hairs. Below, the lower row of lateral tubercles are a few stiff, short hairs on all the segments, except first three. All the tubercles are reddish brown, and thickly covered with rather long black bristly hairs, though in a few rare specimens these hairs are light brown. Underneath the body is black. Prolegs black. Abdominal feet reddish brown. Feeds on all weeds and is exceedingly plentiful. Forms a large very thin silky net, in which are scattered a few hairs, generally under the bark of the liquidamber trees.

Pupa. Length, $\frac{3}{4}$ – $\frac{7}{8}$ inch.

Oval, very slightly rough and shining. Position of tubercles on larva is replaced on segments of pupa by little groups of downy golden brown hairs, which are so short, however, that it is only on careful examination they are visible. This state lasts from three to six weeks. This is a very common species, and is found the entire year. The moth has thus far offered no variation.

NOTE.—We have great pleasure in printing the above paper from the pen of a young but earnest and talented entomologist, at present pursuing his investigations in Mexico. Mr. Schaus is destined to hold a high rank among our future workers, and will add the knowledge of the life history of many species of that country to the records of our science. We wish him every success in his career, and hope to have our pages hereafter frequently enriched by his valuable contributions.—EDITOR.

NOTES ON LEPIDOPTERA.

EGG OF *TOLYPE VELLEDA*.—The eggs of this species are deposited in a long and sinuous string, each one attached to its neighbor by the extreme apex, and all of them covered with the down from the abdomen of the parent. They are ovate, very smooth and shining, olive-brown in color. Even with a very powerful lens, I fail to discover any trace of sculpture, but the eggs are thickly covered with a glutinous substance, which causes the abdominal hairs to adhere closely.

HENRY EDWARDS.

ORGVIA BADIA, HY. EDW.—Some time since I received from my friend, Mr. R. H. Stretch, some larvæ of this form, collected by him in Vancouver Island. He desired me to compare them with those of *O. Antiqua* L., but I had no caterpillar of this species at the time. I have, however, recently received some exquisitely prepared larvæ from Messrs. Watkins & Doncaster of 36 Strand, London, and among them examples of *O. antiqua*. I have made a most careful comparison of these and of the larvæ sent by Mr. Stretch, and I cannot find the smallest difference whatever. I therefore am sustained in the opinion I expressed some time ago (*Papilio*, vol. 1, p. 62), that my

O. badia (which, after all, is a synonym of *O. nova*, Fitch) is the same as *O. antiqua*, L. The synonymy will stand thus:

ORGYIA ANTIQUA, L.

O. nova, Fitch.

O. badia, Hy. Edw.

HY. EDWARDS.

SPILOSOMA LATIPENNIS. Stretch.

This apparently rare species seems to have its home on Long Island. I received it on one occasion from Rev. G. D. Hulst, and on the 16th of June last I took a very fine pair near Flushing. It is a most active insect, and when disturbed flies rapidly to a great distance. In this respect it is very unlike its congener, *S. virginica*. When about to rest it settles on the under side of leaves, as is the habit of many Geometridæ. HY. EDWARDS.

COSSUS ROBINIÆ CONGREGATING.

Having obtained a few larvæ of *Cossus Robiniæ* from a locust tree broken by a storm last winter, I kept them in a tin box with sawdust and chips until the beginning of May. I then turned them into a large glazed fern case outside my window; they had then partially formed cocoons. About noon, June 22, I saw a female, with yet undeveloped wings, crawl rapidly to the top of the vivarium, having just emerged from pupa. In less than ten minutes several males were flying swiftly round the house; about 50 large locust trees are exactly opposite. consequently I could not be in a more favorable locality for this species, but although I have carefully searched the trees during June and July for several seasons, I never before found a male of this insect, and only two females; yet, on this occasion I captured no less than 70 males in fine condition, all attracted by this one female during the afternoon and evening. They flew in a rapid direct flight, making a loud buzz (more like that produced by some Coleoptera than the hum of the Sphingidæ); the weather made no difference to their flight; the day was bright, with occasional showers, but they flew just as freely in the rain as in the sunshine. After dark, the number abated, yet an occasional one flew in until ten o'clock, and strange to say, two fine females of the same species flew in my room to light the same evening. Business called me from home next morning, so I killed the female for a specimen. I had never seen any record of this insect being a day-flyer, and think the fact will be new to many entomologists. The lively habit of this species is in direct contrast with those of *Cossus ligniperda* of Europe, which may be found in great numbers sticking on the trees infested by them, a few inches above the empty pupa case, any afternoon during their occurrence, both sexes being extremely sluggish during the day.

DAVID BRUCE, BROCKPORT, N.Y.

SAMIA CEANOETHI.

I received a few cocoons of *Samia ceanothi* from a correspondent in

California. A fine female emerged one day during my absence from home, and the males of *S. cecropia* congregated in such numbers on the outside of the vivarium in the evening as to alarm my family, the noise of their fluttering wings on the glass being mistaken for fire. My boys caught 50, and said there were "hundreds more." DAVID BRUCE.

STEGANOPTYCHA CLAYPOLEANA.

Through the courtesy of Prof. E. W. Claypole we received this spring from Mrs. L. H. Lewis some larvæ of the buckeye stem-borer noticed in the November 1882, issue of the *American Naturalist* (p. 914), and have obtained therefrom a number of perfect moths. The general resemblance of some of the specimens to others of *proteoterus æsculana* is great; but with the perfect specimens the differences upon close inspection becomes quite marked. *Claypoleana* lacks the notch in posterior borders of primaries, the tufts of raised scales on the disc of same, and the peculiar tufts or pencil of hairs on the upper surface of secondaries in the ♂, between the margin and the costal vein. It is a shorter, broader-winged species; the ocellate spot is less distinctly relieved, the median oblique band more broken, the basal-costal portion paler and contrasted along the median vein with a darker shade, which may be almost black, and which broadens posteriorly till near the middle of wing, where it is abruptly relieved by a pale space obliquing basally. By these characters the species is easily distinguished from *æsculana*, and it is withal a greyer species with the pale and dark shades more highly and abruptly contrasted. In an article by Prof. Claypole, which appeared subsequent to our note (*Psyche*, III., p. 367, issued Dec. 16, 1882), he states that Prof. Fernald referred the species provisionally to *Steganoptycha*, Stephens, and this reference is evidently correct.

None of the larvæ we received were boring in the leaf-stem, but rolled themselves up in the green leaves upon which they fed. It is doubtless more of a blossom and leaf feeder than a stem-borer. The larvæ were feeding during the first half of May, and the moths issued during the first week in June.

C. V. RILEY.

MATING OF CECROPIA AND CYNTHIA.

This spring, having a ♀ *Cynthia*, and wishing to obtain some eggs, I tied her out in my yard to mate. What was my surprise in the morning to find her attached to a ♂ *Cecropia*. She laid a number of eggs, but only four of them hatched. After nibbling for a while on linden and ailanthus, the young larva died, very much to my sorrow. I turned out some *cynthia* some years ago, and now the species is very common in our city.

G. R. PILATE, Dayton, Ohio,

A NEW ZYGÆNID. TRIPROCRIS MARTENII. n. sp.

Exp. .95 inch.

Color uniform dull black, not so brassy as *T. Smithsonianus*; thinly scaled, so that the veins show prominently. Primaries slightly produced apically. Discal cell pedicelled, of the ten short veins given off from

it, the 4th has its origin with the 3d immediately on the cell. The antennæ are less deeply pectinate than in the allied species. Described from 1 ♂ and 5 ♀, taken in Arizona by Mr. H. K. Morrison.

G. H. FRENCH, Carbondale, Ill,

DREPANÆ CURVATULÆ.

Zoological Department, British Museum.

July 6th, 1883.

MY DEAR SIR: In incorporating some of our mutual friend Grote's Lepidoptera with the Museum series, I note a *Drepana* labelled "*curvatula*," which agrees in all respects with my Japanese species *D. acuta*, but differs from the European *D. curvatula* in its greatly superior size and other particulars which I here tabulate:

D. curvatula.

Exp. al. 31-35 mm.

The measurement taken from tip of primaries to centre of thorax and doubled.

D. curvatula.

Lilacine brown, with an ochraceous sub-tint.

Lines on primaries before the middle, placed at unequal distances, sometimes confused.

Oblique elbowed line across disc double, distinctly inarched.

Secondaries divided into a greyish basal and a yellowish external area; the two areas divided by a well-defined line.

D. acuta.

Exp. al. 37-42 mm.

D. acuta.

Uniform clay-yellow.

Lines on primaries before the middle, at equal distances, never confused.

Oblique elbowed line across disc single, almost straight.

Secondaries of uniform, or nearly uniform, tint, with no marked distinction in the definition of the lines.

As it is highly probable that Mr. Grote's specimen was of N. American origin (he doubtless knows where it was obtained), I think it may be of interest to American Lepidopterists if you publish this note in "Papilio."

Believe me, yours very sincerely,

ARTHUR G. BUTLER.

Henry Edwards, Esq.

CECROPIA and COLUMBIA.

This year we had a ♀ *Cecropia* hatch in one of our rooms, and, a score or more of *Samia Columbia* were attracted to the place. Can anyone doubt that the latter is an offshoot of the former?

A. J. COOK, Lansing, Mich.

RARE CAPTURES.

The following species have recently been taken: *Aellopus tantalus* Albany, N. Y.; *Arctia Americana*, Malden, Mass.; *Erebus Zenobia* Madison, Wis.; *Erebus Odora*, Albany, N. Y.

W. GREY.

ETUDES D'ENTOMOLOGIE.

Under this title an exquisite work on Lepidoptera is in course of

publication by M. Charles Oberthur, of Rennes, Ille et Vilain, France. The number before me contains 3 plates, with 44 figures, which are faultless in drawing and general execution. The work will be completed in about 12 numbers, and will be a most valuable contribution to entomological science.

HY. EDWARDS.

KILLING LEPIDOPTERA.—I have been experimenting with the Hypodermic syringe for killing Lepidoptera ever since last fall, and am satisfied of its efficiency. I use a clear solution of cyanide of potassium in alcohol, and by introducing the lancet point of the syringe and injecting a drop of the fluid in the thorax it kills instantly and does not leave any stain on the outside. I have used it in every instance so far on the Lepidoptera as they emerge from the chrysalis. The scales and hairs are thus not disturbed in the least, and the specimen really requires less handling. On trying it with some *Cecropia*, etc., they were dead before putting them down.

C. W. BLAKE.

TO OUR SUBSCRIBERS.

January 19, 1884.

With great regret I am compelled to relinquish the active editorship of "Papilio," the demand upon my time from other and more exacting matters rendering it impossible for me to continue the superintendence of the journal. It gives me, however, great pleasure to be able to state that my friend, Mr. E. M. Aaron of Philadelphia, will accept the position I have vacated, and I am confident that under his able guidance, the continued success of "Papilio" is assured. Mr. Aaron's address is P. O. Box 2,500, Philadelphia, Pa., and I beg that all subscriptions and communications be forwarded to him. I wish most warmly to thank all my friends and correspondents for the generous support they have given the journal lately under my charge.

HENRY EDWARDS.

ERRATA.

On page 136 read Geometrida.

On page 150 read Rectilinea, Fr.

On page 151 read Michabo, Gr.

On page 160, Nos. 8 and 9, *Colias*, are uncertain, and should be blank, with an?

INDEX.

VOL. III.

INDEX TO AUTHORS AND SUBJECTS.

BOOK NOTICES.

- Etudes Entomologiques; par C. Oberthur . . . (H. E.) 192
Insects Injurious to Fruits; by Wm. Saunders. (A. R. G.) 121
New Principle of Protection from Insect Attacks; by J. A.
Lintner (A. R. G.) 122
Pine Moth of Nantucket; by S. H. Scudder. (A. R. G.) 82

- NOTICE TO SUBSCRIBERS; by Hy. Edwards 193

OBITUARY NOTICES.

- Bailey, James Spencer (H. E.) 124, 166
Belfrage, George W. (H. E.) 83
Chambers, Vactor Toucey (Am. Naturalist) 168
Glover, Townend (C. V. R.) 167
LeConte, John L. (H. E.) 168
Zeller, P. C. (A. R. G.) 120

BUTLER, A. G.

- Concerning so-called temperature forms of Butterflies . . . 62

COQUILLET, D. W.

- Leaf-rollers of Illinois 97
New *Nothris*, a, from Illinois 81

EDWARDS, HENRY.

- New forms of the genus *Alypia* 33
New species of *Ægeriadae* 155
Notes on the early stages of some *Heterocera* 24
Some species of *Euchætes* 145

EDWARDS, HENRY and S. L. ELLIOTT.

- On the transformations of some species of *Lepidoptera* . . 125

EDWARDS, W. H.

- Capitalizing specific names 103
Comments on Dr. Hagen's paper in Nov.-Dec. number of
PAPILIO, on *Pap. Machaon*, etc. 45

Comments on a paper entitled "The Genus <i>Colias</i> ," from Proc. Bost. Soc. N. H., Vol. 22	169
Descriptions of new species of Hesperians found in the U. S.	71
List of species of Butterflies collected in Arizona by Mr. H. K. Morrison in 1882	9
Notes on a small collection of Butterflies made in Judith Mountains, Mont., in 1883, by W. M. Courtiss, M. E.	157
Notes on the collection of Butterflies made by Mr. H. K. Morrison in Arizona, 1882	1
On the polymorphism of <i>Lyc. Pseudargiolus</i>	85
ELWES, H. J.	
Concerning so-called species of Butterflies	151
FERNALD, MRS. C. H.	
Flowers attracting Insects	80
List of Noctuidæ taken in Orono, Maine, and its vicinity	21
GROTE, AUGUSTUS R.	
Brief essay on the classification of the Heterocera	35
Capitalizing specific names	105
Conclusion of the list of N. Am. <i>Apatelæ</i>	111
List of <i>Apatelæ</i> belonging to the groups <i>Acronycta</i> and <i>Tricena</i>	67
Notes on new species in Mr. Neumoegen's collection	73
On <i>Stiria</i> , with new genera and species of Noctuidæ	29
Recent S. American paper on Moths	106
Reply to Dr. Hagen	109
HAGEN, DR. H. A.	
Necessary restitution of the names given by Th. W. Harris to two N. Am. <i>Sphingidæ</i>	61
HILL, W. W.	
List of Lepidoptera collected July, 1882	27
KIRBY, WM. F.	
Capitalizing specific names	105
LYMAN, H. H.	
<i>Machaon</i> controversy, the	108, 144
NEUMOEGEN, B.	
Description of interesting new species of Heterocera from all parts of our continent	137
On some new species of <i>Arctia</i> and sundry variations	70
The genus <i>Arctia</i> and its variations	148
RILEY, C. V.	
Capitalizing specific names	62, 105, 164
SCHAUS, WM., JR.	
Descriptions of some of the early stages of some Mexican Lepidoptera	186

STRETCH, R. H.	
Anal appendages of <i>Leucarctia acraea</i>	41
Notes on genus <i>Clisiocampa</i>	19
THAXTER, ROLAND.	
Descriptions of Noctuid larvæ found on Cutts' Island, Maine.	10
WORTHINGTON, C. E.	
On certain <i>Catocalæ</i>	39
WRIGHT, W. G.	
Midwinter Butterflies	117

NOTES ON LEPIDOPTERA.

BLAKE, CHAS. A.	
Killing Lepidoptera	193
BRUCE, DAVID.	
<i>Cossus Robinia</i> congregating	190
<i>Samia Ceanothi</i>	190
BUTLER, A. G.	
<i>Drepana curvatula</i>	192
BRODIE, W.	
<i>Samia Columbia</i> and its parasite	43
COOK, A. J.	
<i>Cecropia</i> and <i>Columbia</i>	192
COLEMAN, N.	
<i>Hyphantria Textor</i> and <i>H. Cunea</i>	26
<i>Papilio Cresphontes</i>	43
COQUILLET, D. W.	
On two closely allied <i>Tarache</i> larvæ	84
DAVIS, W. T.	
Early appearance of <i>Hyph. Cunea</i>	84
EDWARDS, CARRIE M.	
Curious variety of <i>Telea Polyphemus</i>	123
EDWARDS, HENRY.	
<i>Asilus</i> and <i>Geometer</i>	25
<i>Callidryas Fisheri</i> , n. sp.	43
Egg of <i>Tolype velleda</i>	189
<i>Orgyia badia</i>	189
<i>Papilio Cresphontes</i>	26
Rare Lepidoptera in New Jersey	25
<i>Sphinx Sequoia</i>	25
<i>Spilosoma latipennis</i>	190
EDWARDS, W. H.	
Localities of Butterflies	65
<i>Thecla læta</i>	123
Willow, a food-plant of <i>Pap. Rutulus</i>	65

FRENCH, GEORGE W.	
A new Zygænid	191
GILBERT, H. ROY.	
Tolype Laricis	25
GREY, W.	
Rare captures	192
GROTE, AUG. R.	
Appendages of <i>Leucarctia acræa</i>	84
<i>Catoc. Concumbens</i> ab. <i>Hillii</i>	43
<i>Daremma Hagenii</i>	65
<i>Grapta</i> and <i>Calephilis</i>	123
<i>Hadenella</i> (n. g.) <i>pergentilis</i>	123
Hibernating butterflies	123
HAGEN, H. A.	
Biological collection in Cambridge Museum	65
MORRISON, H. K.	
Localities of Diurnals	43
MUNDT, A. H.	
<i>Limnitis Ursula</i> and <i>L. Disippus</i>	26
New method of feeding larvæ	25
PILATE, G. R.	
Mating of <i>Cecropia</i> and <i>Cynthia</i>	191
RILEY, C. V.	
<i>Steganoptycha Claypoleana</i>	191
RIVERS, J. J.	
<i>Ægeria Hemizoniæ</i>	26
<i>Melitæa Chalcedon</i>	26
Rare <i>Sphingidæ</i>	65
WRIGHT, W. G.	
<i>Melitæa Chalcedon</i>	123
WEED, CLARENCE M.	
Appendages of <i>Leuc. acræa</i>	84

GENERAL INDEX.

A

Achatodes Zeæ, larva	134
Acronycta grisea, larva	131
" lithospila, larva	132
" occidentalis, larva	132
Adoneta spinuloides, larva	129
Ægeria æmula	155
" albicalcarata	157
" Bolteri	155
" hemizoniæ, larva	26
Agraulis Juno., larva	187
Agrotis apposita	78
" C. nigrum, larva	133
" forms of	154
" European species of	154
" perfusca	77
" Texana	76
Almodes rivularia	79
Alypia conjuncta	34
" matuta	33
" similis	34
" Wittfeldii	34
Amblyscirtes Cassus	72
Amphidusis cognataria, larva	136
Anthocaris Morrisonii	43
Apatela afflicta, larva	17
" American and European species compared	116
" division into sub-genera	67, 70
" food-plants of	17
" furcifera, larva	14
" larvæ of	116
" larvæ, resemblance of	14
" list of	67, 111
" leporina, larva	15
" lobeliæ, "	14
" luteicoma "	16
" morula "	13
" noctivaga "	15

<i>Apatela vulpina</i> , larva	14
<i>Apatura Antonia</i>	7
“ <i>Celtis</i>	8
“ <i>Leila</i>	7
“ var. <i>Montis</i>	7
Aquatic larvæ	37
<i>Arctia excelsa</i>	70
“ <i>incorrupta</i>	70
“ list of	149
“ var. <i>ochracea</i>	70
“ supposed species of	149
“ variations of	148
<i>Argynnis</i> , doubtful species of	153
“ <i>Nausicaa</i>	I, 6
<i>Arzama</i> , anal tuft of	36
<i>Asilus</i> and <i>Geometer</i>	25
<i>Aspilotes dissimilaria</i>	25

B

BAILEY, JAS. S., death of	166
BELFRAGE, G. W., death of	83
Biological collection at Cambridge	65
<i>Botis generosa</i> , larva	101
“ <i>insequalis</i> , larva	102
“ <i>oscitalis</i> , larva	101
Butterflies of Arizona	I, 9
“ localities of	43, 65
“ of Montana	161

C

<i>Cacœcia semiferana</i> , larva	100
<i>Callidryas Fisheri</i>	43
“ <i>Eubule</i>	6
“ <i>Sennæ</i>	6
<i>Calpinæ</i>	32
<i>Caradrina civica</i>	74
“ <i>fragosa</i>	76
<i>Carneades moerens</i>	30
<i>Catocala</i> , var. <i>confusa</i>	41
“ “ <i>conspicua</i>	40
“ “ <i>decorata</i>	41
“ “ <i>duplicata</i>	40
“ ab. <i>Hillii</i>	43
“ <i>junctura</i>	40

Catocala Ilia	40
“ Lucilla	39
“ var. obsoleta	40
“ parta, larva	24
“ var. umbrosa	41
Cea, n. g.	78
“ immacula	78
Cecropia and Cynthia	191
“ and Columbia	192
Cenopsis reticulatana, larva	99
Ceratonia quadricornis	61
Cerura cinerea, larva	130
CHAMBERS, V. T., death of	168
Charadra deridens, larva	11
“ propinquilinea, larva	12
Clisiocampa, larvæ	19, 20
Clostera inclusa, larva	24
Coatlantona Janais, larva	188
Colias, the genus	169
“ comparison between species of	169-185
“ chrysotheme	172
“ Hagenii	161, 163
Copæodes eunus	43
Cossus Robiniæ	190
Cressonia juglandis, larva	127
Crambodis talidiformis, larva	135
Cuba, insect fauna of	79
Cucullia cita	75

D

Darapsa chœrilus, larva	126
“ Myron, larva	126
Daremma Hagenii	65
Deiopea bella, larva	128
Depressaria atrodorsella, larva	98
“ Grotella, larva	98
“ Heracliana, larva	24
“ hilarella, larva	98
“ Ontariella, larva	24
“ pulvipennella, larva	97
Dichelia sulfureana, larva	99
Drasteria distincta	143
Drepana arcuata	192
“ curvatula	192

E

Ecpantheria aulea, larva	188
Ecthrus Provancheri	43
Etudes d'Entomologie	192
Euchætës collaris	145
" " larva of	146
" cyclica	148
" egle	147
" " larva of	147
" eglenensis	147
" " larva of	147
" Yosemite	146
Eudemis botrana, larva	102
Euplexia lucipara, larva	133
Euleucophæni Hualapai	138
Exartema permundana, larva	102

G

Gelechi agrimonella, larva	98
" discoecella, larva	98
" rhoifruetella, larva	99
" tristrigella, larva	99
GLOVER, TOWNEND, death of	167
Gluphisia trilineata, larva	129
Gonepteryx Aspasia	63
" Nipalensis	63
Grapta and Calephilis	123

H

Habrosyne scripta, larva	10
Hadena smaragdina	140
" transfrons	139
Hadenella, n. g.	123
" pergentilis	123
Halesidota minima	138
Heliophilus, structure of	36
Hemaris uniformis, larva	125
Heterocera, classification of	35
" structure of	35
Hibernating butterflies	123
Hübner's genera	107
Hyphantria cunea	26, 84
" textor	26
Hypopta Manfredi	139

I

Ingura præpilata, larva	135
Insect attacks	122
Insects injurious to fruits	121

K

Killing Lepidoptera	193
-------------------------------	-----

L

Larvæ, new method of feeding	25
Leaf-rollers	97
LECONTE, JOHN L., death of	168
Lepidoptera of Adirondacks	27
" attracted by flowers	80
" of N. Jersey	25
Leucartia acræa, anal appendages of	41, 84
Limacodes scapta, larva	128
Limenitis Disippus	26
" Ursula	26
Lithophane gausapata	77
" laticinerea, larva	135
" pexata	74
" var. Washingtoniana	74
Loxatena ceracivorana, larva	102
" rosaceana, larva	100
Lycæna var. cinerea	8
" pseudargiolus	8, 85, 86, 89, 97
" Sonorensis	118

M

Mamestra bella	29, 30
" grandis, larva	17
" renigera, larva	133
Mecoceras peninsularia	79
Melittæa Colon	43
" Chalcedon	26, 123
" hybernation of	26
" larva of	123
" Perdiccas	43
Melittia Bergii	157
" Ceto	157
" cyanifera	157
Metagarista	107
Moths, S. American	106

N

Nelphe, n. sp. of	79
Nemeophila Geddesii	137
Noctuidæ of Maine	21
Nonagria permagna	73
Nothris trinotella	81
" " larva of	102
Notodonta stragula, larva	129

O

Oedemasia concinna, larva	130
Orgyia badia	38, 39, 139
" " egg and larva	39
Orthosia citinia	74
" nitens	31

P

Pamphila brettoides	71
" Mardon	43
" Sirus	43
Papilio Aliaska	59
" var. Arizonensis	2, 4
" Cresphontes	26, 43
" Daunus	2
" Eurymedon	4
" Hippocrates	5, 6
" Indra	2
" Machaon	45, 48, 50, 63, 108, 143
" var. of Machaon	108
" Nitra	162
" Oregonia	48, 51, 60
" Pompeuis, larva	187
" Rutulus	2, 65
" Thymbræus, larva	186
" Turnus	2
" Zolicaon	5
Paphia Andria = Troglodyta	8
" Morrsonii	8
Parallelia bistriaris larva	136
Parasa chloris, larva	128
Parnassius Hermodur	158
" " habits of	158
" intermedius	158
" Smintheus	158

Penthuria hebesana, larva	101
“ nimbatana, larva	101
Phragmatobia rubricosa, larva	127
Phurys ovalis	75
Pine moth	82
Pine trees, destruction of	82
Platycerura furcilla, larva	11
Platythyris granulata	137
Plusia contexta, larva	18
“ Putnami, larva	19
“ species found in Maine	19
Plusiinae, position of	32
Progenera	36
Pseudanarta falcata	141
Pseudorgyia russula	75
Pseudothyatira cymatophoroides, larva	10
Pyrrharctia Isabella, anal appendages of	84
Pyrrhia exprimens, larva	135
Pyrophila triquetra	78
Pyrrhotænia animosa	156
“ geliformis	157
“ subærea	156
“ Wittfeldii	156

R

Raphia frater, larva	13
Rare captures	192
Retinia frustrana	82
Retirement of Editor	113

S

Samia Ceanothi	190
“ Columbia	42
“ “ parasite of	42
Sciapteron præcedens	155
Scolecocampa liburna, larva	134
Schinia carmosina	142
Specific names, capitalizing	62, 103, 105, 164
Sphingidæ, rare	65
Sphinx chersis	62
“ “ larva of	127
“ sequoiæ	25
Steganoptycha Claypoleana	191
Stibadium curiosum	141
Stiria, the genus	29

Stiriinæ	32
Syneda Athabasca	143

T

Tæniocampa peredia	32
" perfoliata	73
" virgula	76
Tarache candefacta, larva	84
" erastroides, larva	84
" larvæ of	84
Telea Polyphemus	71
" " curious variety of	123
" " var. oculea	71
Teras permutana, larva	100
Temperature—forms of Butterflies	62
Terias anemone	64
" Brenda	64
" connexira	64
" Hecabe	64
" Mariesii	64
" Mandarina	64
" multiformis	65
" Rahel	64
" Sari	64
" Sinensis	64
Thecla Alcestis	10
" iroides	9
" læta	8, 123
Thyridopteryx ephemeræformis, larva	24
Tolype laricis	25, 131
" velleda, larva	130
" " eggs of	189
Tortrix pallorana, larva	100
" quercifoliana, larva	109
Trichoclea, n. g.	30
" decepta	30
Trichopolia, n. g.	76
" dentatella	77
" ptilodonta	77
Trichorthosia, n. g.	31
" parallela	31
Tripocris Martenii	191

U

Ufeus sagittarius	31
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W

Willow, food plant of *P. Rutulus* 65

Y

Ypsia aeruginosa 73

Z

ZELLER, death of Prof. 120

—o—

ERRATA.

Page 11, the sentence "a similar larva" to "margins of the leaves" belongs to *Habrosyne scripta*, and should follow the passage ending "its early moults."

Page 19, for Entomophthura, read Entomophthera.

" 25, line 22, for leuceophæta, read leucophæata. ✓

" 25, " 24, for Monolenca, " Monoleuca.

" 77, " 43, for spmore, " spinose.

" 77, " 43, for alliud, " allied.

" 110, " 6, for Caroiina, " Carolina.

" 110, " 21, for at, " all.

" 119, " 45, for Cardin, " Cardui.

" 159, 23d line from top, read *these* species, for *there* species.

" 172, 2nd " bottom, " *sports*, for *spots*.

" 174, 11th " top, " extra-*discal* markings.

" 174, 31st " " " *in* Philodice.

" 176, 4th " " " *crooked*, for *crooked*.

" 178, 8th " " " *discal*, for *dorsal*.

" 178, 10th " " " ♀, for ♂.

" 178, 11th " " " bracket after *Astræa*.

" 178, 21st " " " *us*, for *me*.

" 178, 22nd " " " *one*, for *I*.

" 178, 27th " " strike out *the* before *Interior*.

" 179, 10th " " read *in* *Interior* after a semi-colon.

" 179, 7th " bottom, bracket after *species*.

" 179, 6th " " " before Mr. Scudder's.

" 180, 6th " top, read are *forms* of one species.

" 183, 33rd " " following *year*.

" 184, 17th " " *of its own form, or Keewaydin*.

TO SUBSCRIBERS.

The publication of the Index to Vol. III of PAPHILIO affords me the opportunity to say a few words which have some interest to myself, and I trust will not be wholly devoid of it to those engaged in the study of our Lepidoptera. A little over three years ago, with the foundation of the New York Entomological Club, was issued the first number of this journal. As is usual in such cases, the most intense enthusiasm was for a time exhibited by its promoters, but after a little while this excitement cooled, and to me, as secretary of the club, gradually fell the whole labor of editorship. Added to this, the work of reading proof, going about fifty blocks four or five times per month to the printer's, folding and mailing the numbers and attending to the very heavy correspondence, was left *wholly* in my hands, and this, too, with the claims of a most exacting profession constantly before me. I was compelled, as is already known, to relinquish the duties thus forced upon me, and I did so with a pecuniary loss upon the three volumes to myself personally of over \$200. I do not make this statement in any begging spirit, but had every Lepidopterist in this country given his support to the journal this loss would not have accrued. It is not too late, however, to atone for the somewhat unfair neglect with which PAPHILIO seems to me to have been received by some entomologists, as a number of copies of the first three volumes are still on hand, and will be supplied, post free, for \$5.00 the set, or quantities at even a lower rate. The first volume may be had, complete, for \$1.50, including its colored plate. Orders for the same may be sent to my address: 185 East 116 Street, New York. I deeply regret the long delay which has occurred in the printing of the present index, but it has been perfectly unavoidable.

HV. EDWARDS.

June 10, 1884.

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112

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