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LEPIDOPTEROLOGICAL OBSERVATIONS.

BY A. R. GROTE, A. M., BUFFALO, N. Y.

Director of the Museum, Buffalo Society Natural Sciences.

Nola ovilla, n. s.

♂. A small frail form with ciliate antennæ, no ocelli, and long, dependent palpi, their second joint thickly squamous. Fore wings grayish white, with the inner line black, fine, angulated. Outer line denticulate, followed by a pure white shade. A pure white shade in the place of the subterminal. Hind wings dusty white. Beneath the fore wings are pale fuscous, immaculate; hind wings whitish with a discal dot. Expanse 16 m. m. Canada, Mr. Saunders. This species differs decidedly from the N. Am. species described by Prof. Zeller; I do not find descriptions of N. Am. species in any other author.

Dilophonota merianæ Grote.

According to my correspondent, Mr. Meske, this species, formerly known from Cuba and Mexico, has been found in Texas by a collector and examples reared from larvæ. It must therefore be included in the List of our Sphingidæ.

Apatela tritona (Hübn.) Zutr., 107, 108.

Hübner's figure has the t. p. line more irregular and the hind wings more yellowish than the form we consider as intended. *A. grisea*, differs by the white hind wings, and is, *perhaps*, redescribed as *pudorata* by Mr. Morrison in the Annals of the N. Y. Lyceum. No comparison with *grisea* is made of his new species by Mr. Morrison. Specimens of *tritona* show the stigmata, and the inner edge of the reniform is perhaps included with the median shade in Hübner's figure. It is on a line with it in the specimens, which have also the small orbicular very faintly outlined and which latter may be indicated by the two dots in Hübner's figure. On the whole, I cannot see that Guenée's description of *tritona* differs from my material, and it is not clear that Mr. Morrison has identified a species more nearly resembling Hübner's figure than the ordinary identification of *tritona.*

Apatela grisea (Walk).

I have examined Mr. Walker's types in the British Museum, and I made the note: Fore wings like *tritona;* hind wings white. Professor Bélanger sent me a species which I considered to be this of Walker's. It now appears to me that Mr. Morrison has altered my determination and described the moth as a new species. I think that, until Mr. Walker's species is more satisfactorily identified, my own determination should not be interfered with.

I have since identified several of the species marked unknown to me in the "List" of 1874. A shorter compilation of the "List" is now published. It is no proof that the species is unknown now, that it was at that time. For instance, I have since identified *Schinia gracilenta,* and it seems to me that it is the same as *oleagina* Morr.; in my specimen the subterminal space is a little darker than terminal, as somewhat exaggeratedly shown in Hübner's figure; there is a faint discal discoloration beneath and traces of a subterminal line; the hind wings above are hardly "rosy" along exterior border. My specimen is undoubtedly the same species as Mr. Morrison's, and also came from my old school-friend Mr. Graef. I come to the conclusion that *oleagina* is not a var., but a synonym of *gracilenta.*

Apatela dentata, n. s.

♂. This is allied to *tritona* and *grisea,* but is a smaller species wanting all the black dashes. The ground color is blackish, shaded over with whitish. The lines black, single, denticulate. The claviform is indicated by a slight black mark. Orbicular obsolete. Reniform whitish, rounded, with its outward edge black-lined and shaded. T. a. line running in a little on median vein. T. p. line inaugurated above the reniform, running well outwardly, denticulate throughout its length. Subterminal line hardly apparent; a blackish shade over median nervules on the gray terminal space. Fringes gray preceded by blackish interspaceal markings. Hind wings fuscous, lighter towards the base, with indistinct line. Beneath much paler, irrorate, without discal marks and with a common shaded line.

Expanse 32 m. m. Quebec, Mr. Bowles.

Mamestra Goodelli, n. s.

♀. Resembles at first sight *Hadena miselioides*, but the eyes are hairy, size smaller, and color more brownish. Fore wings shiny reddish brown, with the terminal space and costal region shaded with greenish. Collar greenish, edged with black. Thorax reddish with the tegulae dark margined. Transverse lines geminate, rather indistinct, slightly lunulate; t. p. improminently exserted. Orbicular small; reniform moderate, ill-defined, outwardly shaded with whitish. Subterminal line improminent; no W-mark. Hind wings fuscous with pale fringes; beneath with terminal space of primaries pale. A double exterior shading and discal point on secondaries; primaries fuscous, with the commencement of an angulated exterior line indicated on costal region and obscure discal point. Above the pale pre-apical costal points are noticeable. *Expanse* 30 m. m. Amherst, Mass.; from Mr. L. W. Goodell, after whom I name the species, and numbered 291.

The greenish or olive tintings of this species are difficult to localize and are very slight.

Dianthoecia lustralis, n. s.

♀. Resembles *Mamestra legitima;* allied to *Dianthoecia pensilis.* Lilac gray, the median space shaded with light reddish below median vein and about reniform. Median shade blackish, diffuse. Lines improminent, geminate, the pale included spaces noticeable; t. a. line outwardly exserted, narrowing the median space. Claviform marked by a short black oblique dash. Orbicular small, pale, distinct, rounded. Reniform narrow, pale, with an interior annulus. S. t. line below vein 6 preceded by a carneous shading, and followed by dark scales; inflected below vein 2. Fringes dark, obscurely cut with pale. Hind wings dark fuscous with paler fringes; the median line from beneath reflected. Under surface of hind wings paler than above, showing dot and line; fore wings fuscous with paler terminal space. Collar with a black line. Expanse 30 m. m. Racine (O. Meske).

Anarta promulsa.

Mamestra promulsa Morr., Ann. N. Y. Lyc., 1875, 97.

♀. This is rather a large species for the genus, but its characters are those of *Anarta*, and it is allied to *Anarta nivearia* Grote. A good example is in the collection of the Buffalo Society of Natural Sciences, received from Mr. Theo. L. Mead and ticketed "20, Colorado." The eyes are hairy; thorax and head shaggily haired without mixture of scales; head improminent; abdomen without tufts; size a little larger than *Anarta subfuscula* Grote, from the same locality, with which species it agrees in the shape of the wings; the tongue is stout. I suppose the hairy eyes induced the reference to *Mamestra*, this, with the other characters, agreeing in reality with *Anarta.*

Lygranthoecia Meskeana, n. s.

Fore wings smooth with the terminal space olive green, the median space light purple and the basal brownish. Median lines geminate with white included spaces; the t. a line straight to median vein, below which it is slightly outwardly rounded; t. p. line sinuate, becoming medially indicated by white dots. Fringes olivaceous. Hind wings black with a band of three light yellow spots; a pale interruption medially along terminal margin; fringes yellowish. Thorax and head olive; abdomen yellow. Legs marked with reddish. Beneath pale yellow, fore wings with a sub-basal triangulate patch, a discal spot and subterminal band black; above the spot and band are vinous costal shades. Hind wings with black discal spot and black subterminal band extended along internal margin and basally within the spot; costal region vinous. *Expanse* 24 m. m. Bastrop Co., Texas, from Mr. O. Meske, to whom I dedicate the beautiful species.

Heliothis lupatus, n. s.

♀. Fore tibiæ with a longer inner and shorter outer terminal claw. Habit of *phlogophagus.* The entire insect is ochreous, stained with a reddish tint. Fore wings with the t. p. line guttate, black points, touched with white; t. a line dentate. Reniform black with white centre; orbicular small, blackish; median shade deeper colored than the wing; the wing deepens outwardly in tone or becomes more orange. The narrow subterminal space is darker. A terminal series of black dots alternated with orange. Fringes plumbeous, contrasting. Hind wings like fore wings, with pale fringes, a small faint discal mark and fine central line; similar beneath, where the fore wings show a large exterior and small interior black discal spot and an indication of an exterior black shade line. *Expanse* 28 m. m. Bastrop Co., Texas, Mr. Meske.

Tarache binocula, n. s.

Allied to *cretata.* Fore wings yellowish white with a perpendicular median yellow stripe which margins, below the median vein, outwardly, a broad subterminal plumbeous black band, running obliquely to costa before the apex and edged outwardly with a yellowish stain. Terminal space cut by a blackish line. In one specimen the plumbeous band is obsolete and there is nothing on the yellowish white primaries but the perpendicular yellow median stripe, narrowly edged with blackish below median vein, the rounded discal blackish reniform (which in the type is included in the plumbeous color and faintly edged with white) and some yellow apical shadings. Fringes white. Hind wings silvery white with fuscous terminal shade widening at apices. Beneath fore wings fuscous, whitish along costa and internal margin; hind wings white with the costa sometimes a little touched with fuscous and external margin obsoletely lined. Expanse 21 m. m. Texas, Mr. Belfrage, No. 112. Bastrop Co., Mr. Meske.

It has perhaps been confounded with *cretata*. *Cretata* is milk white; *binocula* yellow white, and the coloration of fore wings beneath gives distinguishing characters. The rounded reniform is a noticeable character and allies the moth to *candefacta*, than which it is a stouter species.

Spragueia guttata, *n. s.*

Allied to *dama* and *leo*, but strongly differing in the detail of the markings. The fringes are orange, touched with black at internal angle opposite the cell (as in *dama*) and at apices. The wing is broken up into sulphur yellow spots by the black lines and ground color. An orange median fascia extends upwardly to the disc before the yellow, black-circled, round reniform, and extends to apices beyond the spot. Internal margin touched with orange at base. Collar and tegulae orange; disc of the thorax yellow, marked out by black inner lines to the patagia and with two plumbeous spots. Hind wings blackish; abdomen zoned with pale yellow, beneath whitish with orange tip. Beneath the wings are blackish with faint lines; on primaries the orange fringes are marked with black as on upper surface. *Expanse* 16 m. m. Bastrop Co., Texas, Mr. Meske.

Spragueia fasciatella, *n. s.*

Allied to *tortricina* Zeller, and similarly sized, differing by the dull ochreous or paler color of the narrow fore wings, which have black fringes, and by the t. p. line being visible and preceded by a shade of a deeper tint than the ground color; the s. t. line is also preceded by a similar shade band. Black dots mark the stigmata; the rounded t. a. line is also followed by a darker shade. Variable in tone and distinctness of the three shade bands. Hind wings and under surface much as in *tortricina*. Texas, Belfrage, Nos. 125 and 126, July 6, 8.

Agrotis turris Grote.

Under this name, which I communicated to Mr. Norman before his leaving for Europe, I drew up the description from Canadian specimens (sent me by Mr. Norman), which has since been published under the determination "Cinereomacula Morr.," in the Proc. of the Phil. Acad. of N. Sciences. I made this alteration in the proofs because Mr. Morrison sent me a specimen of *turris* as his "cinereomacula," previously imperfectly described by him in the Boston Proceedings. Upon Mr. Morrison's request I sent him my specimens. On their return I am surprised to find that he declares his "cinereomacula" to be something different, and returns me my own specimens as *his* types under a *new* ms. name of *his*, thus suppressing my own prior designation for the species which I had previously communicated to him and had only abandoned in consequence of his own determination. The species will be known under the above name of *turris*.

Agrotis minialonis Grote.

I have, through the kindness of my correspondents, been very recently able to compare my types of this species and *rufipennis* Grote. The names are synonymous, the latter name having been founded on a specimen with obliterate ornamentation. Both specimens are from New York, and I had returned Mr. Mead's type long previously to receiving Mr. Lintner's.

EXPLANATION OF PLATE.

The specimens illustrated on the accompanying Photographic Plate were taken at St. Catherines or Orillia by Mr. George Norman, of Cluny Hill, Forres, Scotland, and are interesting since they are mostly types of new species described in these pages. Their discovery is due to the scientific enthusiasm of Mr. Norman, who has spent two years in Canada to the benefit of Entomological knowledge and the pleasure of his North American friends.

The following is the explanation of Plate 1:

1. Parastichtis gentilis *(Grote)*. Male type.

2. Parastichtis perbellis *(Grote)*. Female type.

A second specimen has been since received from London (Mr. Saunders).

3. Parastichtis minuscula *(Morr.)*. Female. Orillia, Mr. Norman.

4. Litholomia napaea *(Morr.)*. Orillia.

5. Agrotis friabilis *Grote*. Type.

6. Agrotis campestris *Grote*. Type.

I am informed by Mr. Morrison that this is *Agrotis decolor*, Proc. Bost. S. N. H., 1874, 162. This was not readily perceivable from the remarks of Mr. Morrison, who compared his species with *geniculata* G. & R., whereas *campestris* is very close to *tessellata*. A specimen sent to Mr. Morrison after the Boston paper appeared was returned to me as a "var. of *tessellata*"; and without nearer determination, I accordingly described it, not agreeing with this determination, and am surprised to find it now stated to be "*decolor*."

7. Agrotis (Matuta) Catherina *Grote*. Female type.

8. Agrotis (Pachnobia) Orilliana *Grote*. Female type.

This I am informed is *A. claviformis* l. c. This species belongs to Guenée's genus *Pachnobia*. Its short description in the Boston Proc. was additionally unintelligible, since "*claviformis*" is there compared to *sigmoides*, which latter belongs to a different group.

9. Agrotis versipellis *Grote*. Male type.

10. Apatela subochrea *Grote*. Type.

Allied to the European *salicis*.

11. Oligia versicolor *Grote*. Type.

12. Agrotis badicollis *(Grote)*. Male. Orillia.

13. Crocigrapha Normani *Grote*. Type.

14. Agrotis rubifera *Grote*. Type.

I formerly incorrectly determined this last species as the same with the European *rubi*. Dr. Speyer has kindly compared it and finds our species different.

AN ABSTRACT OF DR. AUG. WEISMANN'S PAPER ON "THE SEASONAL-DIMORPHISM OF BUTTERFLIES."

[LEIPZIG, 1875, PUBLISHED BY W. ENGELMANN.]

To which is Appended a Statement of Some Experiments made upon Papilio Ajax.

BY W. H. EDWARDS, COALBURGH, W. VA.

Dr. Weismann has lately published an account of certain experiments made by him during a course of years with a view to determine the facts relating to seasonal-dimorphism, and from them to deduce the reasons for the phenomena. As several North American butterflies are thus dimorphic, I have thought that the substance of Dr. Weismann's paper would be interesting to the readers of the ENTOMOLOGIST, it being too long to print in full. I have therefore written out the following abstract, following as closely as possible the language of the author. I have added a statement of my own experiments with *Papilio ajax*, the results of which confirm the theory advanced by Dr. Weismann as to the causes of the phenomena in question.

The phenomena of seasonal-dimorphism had been known for a long time, and had been established in the case of *Vanessa prorsa* and *levana* early in this century, *prorsa* being the summer, *levana* the winter form. Prof. Zeller ascertained that *Lycaena amyntula* and *L. polysperchon* were summer and winter forms of one species. Dr. Staudinger found *Anthocharis belia* and *ausonia* to have the same relationship. On his interest being excited by these cases, the author instituted experiments. At first he supposed that the difference in the butterflies might be of a secondary nature, having its foundation in the difference of the larvæ, which might be owing to the difference in the food plants of the winter and summer broods. But the most strongly dimorphic butterfly, *levana*, feeds on one plant only, *Urtica major*, and although the larvae show a pronounced dimorphism, the two forms do not alternate with each other, but make their appearance in every generation. He then experimented on the indirect influence of the seasons, but concluded that the cause of the phenomena did not lie here. It must then lie in the direct influence of changing outward conditions of life, those in the winter generation being undoubtedly different from those of the summer generation. There are two factors from which such an influence might be expected, temperature and length of development, i. e., the duration of the pupa period. The duration of the larva period may be neglected, as this is very little shorter with the winter generation (at least with the species used for experiment). Starting at this point, experiments were made with *levana*. From the eggs of the winter generation, which had emerged as butterflies in April, the author bred larvae, which, immediately after they turned to chrysalids, were put into an ice box, in which the temperature was but 8° to 10° R. (52° Fahr.) It appeared that this temperature was not low enough to have much effect, for when after 34 days the box was taken out of the ice chest, all the butterflies (about 40) had emerged. The experiment succeeded in so far that instead of the *prorsa* form to be expected under ordinary circumstances, most of the butterflies emerged as the so-called *porima*, i. e., as one of the intermediate forms between *prorsa* and *levana*, sometimes taken out of doors, and which more or less resembles *prorsa* in design, but has much yellow like *levana*. In the succeeding experiment the author placed the pupae directly in the ice house, where the temperature was 0 to 1, R. (33° Fahr.), and left them there four weeks. Of twenty butterflies fifteen emerged *porima*, and among these were three which looked exactly like *levana*, except that the narrow blue border line was wanting. Five butterflies of the lot were unchanged, but came out *prorsa*, and therefore were uninfluenced by the cold. From this it appeared that by four weeks of cold down to 0-1 R., a greater part of the butterflies inclined toward the *levana* form, and single individuals arrived at the same almost completely. Should it now not be possible to make the change complete, so that every one should have the *levana* form? But the author never succeeded in bringing this about. There were always some individuals which kept the summer form, others were intermediate, and but a few so changed that they looked like genuine *levanas*.

Experiments succeeded better with some of the Pierides, many of which show the phenomena of seasonal-dimorphism. In *P. napi* the summer and winter forms differ strikingly. Numerous individuals of the summer generation were set in the ice house immediately after becoming chrysalids, the cold being 0-1 R., and were left for three months, then brought (11th Sept.) into the green-house. Between 26th Sept. and 3rd Oct. there emerged 60 butterflies, which, without an exception, bore the characters of the winter form, most even in an uncommonly strong degree. But all did not emerge in the green-house, a part going over the winter, and emerging the winter form the next spring.

The author repeatedly tried the experiment of changing the winter to the summer form by the application of heat, but always failed, and concludes that *it is not possible to constrain the winter generation to embrace the summer form.* He then goes on to state that *levana* has not only two generations in a year, but three, and is polygoneutic (coining a word to indicate the fact whether a species has one, two or more generations: mono-di-poly-goneutic, from goneuo, to produce). A winter generation alternates with two summer generations, and the last of these gives as the fourth generation of the year hybernating pupæ, which in the next April emerge as the first generation, and in the *levana* form. Such pupæ (of the fourth gen.) he many times, immediately on their reaching that stage, placed in the green-house. But the result was always the same; nearly all the pupae hybernated. In one instance only did a *porima* appear among them, all the rest being *levana.* But some of the butterflies emerged in the autumn, after 14 days in pupa. These were always *prorsa* except in one instance of *porima.* From these experiments it appeared that like causes (warmth) have different effects on the different generations of *levana.* With both the summer generations the high temperature induced always the *prorsa* form; with the third this happened but seldom and with single individuals, while the great mass kept the *levana* form unchanged. One might say that this has its foundation in the fact that the third generation has no inclination to hasten its emerging under the influence of warmth, but that by a longer duration of the pupa state must always come out the *levana* form. The cause of different behavior under like influences can lie only in the constitution, the physical nature, of the generation concerned, and not in outside influences. It distinctly appears that cold and warmth cannot be the immediate cause why a pupa emerges *prorsa* or *levana.* The explanation of the facts is given as follows: The *levana* form is the primary original type of the species. The *prorsa* form the secondary, produced by the gradual influence of the summer climate. Where we are able by cold to change individuals of the summer generation into the winter form, this rests upon a reversion to the original form, upon atavism, which, as it appears, is most readily called out by cold, that is, *by means of the same outside influences to which the original form was exposed through a long period of time,* and whose continuance has preserved to this day, to the winter generation, the primitive marking and color. The arising of the *prorsa* form the author imagines to have occurred as follows: it is certain that a so-called ice period existed during the diluvial period in Europe. This may have spread a true polar climate over our temperate zone, or perhaps a lesser degree of cold may have prevailed, with increased deposition of rain and snow. At all events, the summer was then short and comparatively cool, and the existing butterflies could only produce one generation in a year. They were all monogoneutic; *levana* had but the form of *levana*. When the climate gradually became warmer, a period must have come on in which the summer lasted so long that a second generation could be interpolated. The pupae of the *levana* brood, which had hitherto slept through the long winter, could now during the same summer in which they had hatched as larvae fly as butterflies. Only the brood which proceeded from these last hybernated. There had come to be a state of things in which the first generation grew up under very different climatic influences from the second. So considerable a change as now exists between the *prorsa* and *levana* forms could not have taken place suddenly, but must have done so by degrees. If it did arise suddenly, this would signify that every individual of this species possessed the power to take two different shapes according as it was subjected to warmth or cold. But the experiments have shown that this is not so, that rather the last generation has an ineradicable tendency to take the *levana* form which protracted heat will not alter, while both summer generations have a preponderating tendency towards the *prorsa* form, although they allow themselves frequently to assume the *levana* form in various degrees by lengthened influence of cold.

It seems to the author that the quoted result of his experiments may not only easily be explained by the supposition of a gradual climatic influence, but that this supposition is upon the whole the only admissible one. While by the changes from the ice period to that of our present climate, *levana* altered gradually from a monogoneutic to a digoneutic species, at the same time a sharper dimorphism stamped itself gradually upon it, which only arose through the changing of the summer generation, while the winter generation held fast to the primary shape and marking of the species. When the summer became still longer, a third generation could be interpolated, and the species became polygoneutic, and in this manner, that two summer generations alternated with one winter generation.

The theory explains why at the same time the summer generation was allowed to change, but not the winter one. The last cannot possibly return to the *prorsa* form, because this is much younger than itself. But when among a hundred cases one appears where a pupa of the winter generation, induced by warmth, completes its change (to *prorsa*) before winter, this is inexplicable. It cannot be atavism which here compels it in the direction of the emergence; but we see from it that the changes in the first two generations have already called forth a certain change in the third, which discovers itself in this, that under favorable circumstances single individuals assume the *prorsa* form. Or, as might also be said, the alternating transmission, which carries with itself the ability to take the *prorsa* form, as a rule remains latent in the winter generation, then with single individuals turns to a continuous transmission. It is true we have as yet no kind of insight into the nature of the process of inheritance, and therein the incompleteness of this explanation is marked, but we still know many of its outward forms of phenomena. We know that one of these forms consists in this, that peculiarities in the father will appear again not in the son, but in the grandson, or even further on; that, too, they may be transmitted latent. Let us suppose a peculiarity should be so transmitted that it always appeared in the first, third and fifth generations, and remained latent in the intervening ones. It would not be incredible that the peculiarity should exceptionally, that is, from a cause unknown to us, appear in single individuals of the second or fourth generations. But this agrees with the cases mentioned in which exceptionally single individuals of the winter generation took the *prorsa* form, only with the difference that here a cause—heat—appeared which occasioned the bringing out the latent characters; though in what way it exerts this influence we are unable to say. These exceptions to the rule are no objection to the theory. On the contrary, they give us a hint that where one *prorsa* generation had formed itself, the gradual insertion of a second might be facilitated by the existence of the first. It is not to be doubted that in the open air single individuals of the *prorsa* form sometimes emerge in September or October. But if our summer were lengthened by a month or two, these could lay the foundation of a third summer generation, just as a second is now an accomplished fact.

Dorfmeister (who formerly experimented on the effect of cold on pupae of butterflies) believes that he may conclude that temperature exerts the greatest influence during the turning into chrysalis, but nearly as much shortly after the same period; and this conclusion may be correct in so far as everything depends on whether in the beginning the formative processes in the pupa turned in this or that direction, the final result of which is the *prorsa* or *levana* type. When, however, one or the other direction has been taken, it may through the influence of temperature be accelerated or retarded, but cannot be any more changed. It is very possible that a period may be fixed at which warmth or cold might be able to divert the original tendency most easily, and it may exist in the first days of the pupa state.

If it be asked why in the analogous experiments with *napi* the reverting was always complete, we may suppose that with this species the summer form has not been so long in existence, and therefore will be more easily abandoned; or that the difference between the two generations has not become so distinct, which, moreover, indicates that here again the summer form is of younger origin. Or, finally, that the inclination to revert may be quite as great with different species as with different individuals of the same species. But at all events, the facts are confirmed, that all individuals will be moved by cold to a complete reversion. The opinion is expressed in reference to *prorsa*, that in these experiments it does not depend so particularly on what moment of the development the cold is applied, and that differences in the constitution of individuals are much more the cause why the cold brings these pupæ to a complete reversion and those to but a partial one, and has no influence whatever on others. Especially interesting in this relation is the American *Papilio ajax*. This butterfly, similar to the European *podalirius*, appears wherever it is found in three varieties, which are designated as var. *telamonides*, var. *Walshii*, and var. *marcellus*. Edwards has proved by experiments, breeding from the egg, that all three forms belong to the same cycle of development; of such nature, that the first two appear only in spring and always come only from over-wintering pupae, while the last form, var. *marcellus*, only appears in summer and that in three generations successively. There appears here a seasonal-dimorphism allied to common dimorphism. Winter and summer forms alternate with each other, but the first appears again in two forms, or varieties, *telamonides* and *Walshii*. Omitting for the present this complication, and looking at these winter forms as one, we have four generations, of which the first possesses the winter form; the three following, on the contrary, the summer form, *marcellus*. The peculiarity of the species lies in this, that with all these summer generations only a part of the pupae emerge after a short time (14 days), but another portion remain the whole summer and the following winter in the pupa sleep, in order to emerge only in the spring, and then always in the winter form. For example, of fifty pupae of the second generation which had formed chrysalids at the end of June, after fourteen days, forty-five *marcellus* emerged, but five remained over till the next spring and then emerged *telamonides*. The explanation of this fact follows very simply from the above stated theory. According to this the two winter forms must be considered as the primary, but the *marcellus* form as the secondary. But the last is not yet so firmly established as with *prorsa*, where a reverting of the summer generation to the *levana* form is only accomplished through special outside influences; while here there are in every generation single individuals with which the inclination towards reversion is still so strong that the extremest heat of summer is incapable of diverting them from their original hereditary disposition, to accelerate their emerging and to force them to take the *marcellus* form. Here it is indubitable that the old hereditary tendency is not restrained by different outside influences, but wholly by internal causes, for all the larvae and pupae of many different broods were simultaneously exposed to the same outside influences. If it be asked what significance belongs to the duplication of the winter form, it may be answered that the species was already dimorphic at the time when it had but one generation a year. Still this explanation may be gainsaid, for such a dimorphism is not elsewhere known, though indeed some species possess a sexual dimorphism in one sex—the female —as in the case of *Papilio turnus*, which has two forms, but not as is here the case, belonging to both sexes. And therefore perhaps another theory must be advanced. With *levana* we saw the reversion occurring in very different degrees with different individuals; only rarely it reached the genuine *levana* form, generally only succeeding in reaching part way, as far as the so-called *porima* form. Now, it would be at all events astonishing if with *Papilio ajax* the reversion were every where complete, as exactly here the inclination to revert is so different in different individuals. It might therefore be presumed that one of the two winter forms, indeed *telamonides*, is nothing else than an incomplete reverting form, answering to *porima* with *V. levana*. Then *Walshii* only would be the original form of the butterfly, and with this would agree the fact that this variety appears later in the spring than *telamonides*.* Experiments ought to be able to give the explanation. The pupae of the first three generations placed upon ice ought to give for the greater part the *telamonides* form, the lesser portion should be *Walshii*, and only a few, perhaps no individuals should emerge *marcellus*. And this may be assumed to be

* There is an error here, *Walshii* being the earlier form.—E.

the result, from the view that the inclination to revert is great, that even with the first summer generation, which were the longest exposed to the summer climate, always a portion of the pupae, without artificial means, emerged *telamonides*, but another portion *marcellus*. This last will now become *telamonides* by the application of cold; the first, on the contrary, will wholly or in part revert to the original form *Walshii*. One would expect that the second and third generations would revert still more easily, and in greater percentage than the first, because these last had first taken the new form *marcellus*, but from the experiments so far made can no other conclusion be drawn. To be sure, of the first summer generation, only seven pupae out of sixty-seven over-wintered and emerged *telamonides*; while of the second generation forty out of seventy-six over-wintered; of the third twenty-nine out of forty-two. But for closer conclusions more extended experiments will be necessary.

After the experiments so far had, one might still incline to the supposition that through seasonal-dimorphism the outside influences working directly upon single individuals would force upon them one or the other form. But this is not tenable. That cold does not bring one and heat the other form follows from this, that with *ajax* each generation produces both forms. Further, the author often reared the last, or over-wintering generation of *levana* in the warmth of a room, and yet always got the winter form. The length of the pupa period does not determine in individual cases the form of the butterfly, or consequently determine whether the winter or summer form shall emerge, but the length of the pupa period is dependent upon the tendency which the growing butterfly has taken in the pupa. As a rule, the two winter generations of *ajax* emerge only after a pupa period lasting from 150 to 270 days, but single cases occur in which the period is no longer than with the summer form (14 days). With *levana*, too, occurs a similar phenomenon, for not only was the winter form forced to a certain degree by artificial warmth during the pupa period, but the summer generation produced many reverting forms without the period having been at all protracted. The half way reverting form *porima* was known long before any one thought of producing it artificially by the influence of cold. It appears in midsummer on the wing occasionally. * * * * If the explanation, then, is correct, the winter form is the primary and the summer form the secondary, and such individuals as embrace either naturally or artificially the winter form are to be considered as examples of atavism. It appears also that the individuals of a species are influenced by climatic change to a variable extent, so that the new form is made permanent sooner in one species than in another. From this there must follow a variability of the generations concerned, that is, single individuals of the summer generation must differ more widely in markings and coloring than is the case with those of the winter generation. The facts agree with this as regards *levana*, the winter form being much more constant than the summer, and in this *(prorsa)* it is hard to find two individuals exactly alike.

So far I follow the paper. After reading it I wrote Dr. Weismann as to the peculiarity noticed by me that while out of doors, in the early spring, *Walshii* was abundant, and for some weeks the only form of the species to be met, I had scarcely ever been able to obtain it by breeding, all the over-wintering chrysalids, with one or two exceptions, no matter from which generation, producing *telamonides*. In the Supplementary Notes to Butterflies of N. A., I had given the results of ninety-two over-wintering chrysalids from eggs of many broods of the three forms bred in 1871, and not one *Walshii* appeared, while that same spring, 1872, between the 11th and 29th of April, Mr. Mead, at Coalburgh, had taken sixty-three specimens of *Walshii*, and had taken or seen but one *telamonides*. To this Dr. Weismann replies: "The case of *Walshii* and *telamonides* is indeed very singular and not easy to explain. Nevertheless, I should believe that the ordinary warmth of the room in winter is the cause which prevents the chrysalids acquiring the perfect winter form *Walshii*. The case of *ajax* is more complicated than the other cases of seasonal-dimorphism. It seems now to me possible that not the form *Walshii* is the primary, but *telamonides*. It seems *telamonides* results from all generations. This primary form could have been changed by summer heat into *marcellus*, by winter cold into *Walshii*. But this would pre-suppose that *telamonides* has originated in the south and there resided at the time of the great glaciers."

Following the suggestions of Dr. Weismann, I have made experiments the past season on the chrysalids of *ajax*, having bred from eggs laid by var. *telamonides* the last of May many larvæ, from which resulted between 22nd and 26th June, 122 chrysalids. These as fast as formed were placed on ice in the refrigerator, in small tin boxes, and when all were formed were transferred to a cylindrical tin box, four inches in diameter and six high, and packed away in layers between thin partings of fine shavings. (I used shavings because no better substance was at hand, having found cotton liable to mould when exposed to dampness.) The box was set in a small wooden box, and this was put directly on the ice and so kept till 20th July. I had then to leave home for a few weeks and sent the box to the ice house, with directions to place it on the surface of the ice. I learned afterwards that this was not done, but that it was set on straw near the ice. By this means the influence of the cold was necessarily modified, and I doubt if the chrysalids within the box, from the manner in which I had packed them, were equally subjected to the cold, those on the outside certainly feeling its full effects, but those in the middle to a less degree, and perhaps so much less as not to have made the experiment of much value so far as they were concerned. I returned on the 20th of August and was informed that the ice in the house had just failed. The chrysalids had been subjected to quite a low temperature, and an equable one, while in the refrigerator for between three and four weeks, but from the defective packing had then probably not felt the cold in an equal degree, and they had been subjected to a lesser degree of cold in the ice house for five weeks longer, which also for some time must have been daily diminishing as the volume of ice decreased. That the severity of the cold was not sufficient to prevent the emerging of the butterflies was apparent when I opened the box, for there were discovered a number of dead ones, which had died as soon as they emerged, the wings being quite unexpanded. I threw out twenty-seven such, besides a number of dead chrysalids, and lamented that my experiment had failed, and that the work would have to be done over again next year. But one butterfly was alive, just from its chrysalis, and this I placed in a box in the house in order that it might expand. Here it remained forgotten till late at night, when I discovered that it was a *telamonides of the most pronounced type.* The experiment had not failed then. Early in the morning I made search for the dead and rejected butterflies, and recovered a few. It was not possible to examine them very closely from the wet and decayed condition they were in, but I was able to discover the broad crimson band which lies above the inner angle of the hind wings, and which is usually lined on its anterior side with white, and is characteristic of either *Walshii* or *telamonides*, but is not found in *marcellus*. And the tip only of the tail being white in *Walshii*, while both tip and sides are white in *telamonides*, enabled me to identify the form as between these two. There certainly were no *Walshii*, but there seemed to be a single *marcellus*, and excepting that all were *telamonides*.

The remaining chrysalids were now kept in a light room, and next day three *telamonides* emerged. By the 4th September fourteen of the same form in all had emerged, but as yet no *marcellus* or intermediate form After that date a few *telamonides* appeared at intervals up to 20th Sept., but a large proportion of the butterflies, namely, twelve out of twenty-six, between the 4th and 15th were intermediate between *telamonides* and *marcellus*, some approaching one, some the other more nearly. On 4th Sept. the first examples wholly *marcellus* appeared, and one followed on each day, the 6th, 8th, 13th and 15th; from the 15th to th. 3rd of Oct. six out of ten were *marcellus*, and two intermediate; a single example between *telamonides* and *Walshii* appeared 3rd Sept., in which the tails were white tipped as in *Walshii*, but in size and other characters it was *telamonides*, though the crimson band might have belonged to either form. Up to the 20th Sept. one or more butterflies emerged daily, on one day, the 4th, eleven; after the 20th single individuals appeared at intervals of from four to six days, and the last was on 16th Oct. So that the whole period of emerging after the box was brought from the ice house was 57 days, and it had commenced some time before that occurred. The natural duration of the chrysalis state in such examples of *ajax* as emerge the first season is only about fourteen days, but in very rare instances in my experience single individuals have emerged after a period of from four to six weeks. In all, 50 butterflies emerged between the 20th August and 8th October, divided as follows:

Telamonides..	22.
Between Telamonides and Walshii..........................	1.
Between Telamonides and Marcellus, and nearest the former	7.
Between Telamonides and Marcellus, and nearest the latter..	9.
Marcellus..	11.

Great uniformity is observable in the size of all these butterflies, their average being that of the ordinary *telamonides*. The examples of *telamonides* especially are strongly marked, the crimson band in a large proportion of them being as conspicuous as is usual in *Walshii*, and the blue lunules near the tail are remarkably large and bright colored. Of the *marcellus*, in addition to the somewhat reduced size, the tails are almost invariably shorter than usual and narrower, and instead of the characteristic single crimson spot, nearly all have two spots, often large. In all these particulars they approach *telamonides*.

To the *telamonides* which emerged after 20th Sept. must be added most of the butterflies which were found dead in the box at that date, and this would bring the number to nearly fifty of that form. There remain of the original 122 chrysalids (several having died without yielding the imago), 28 chrysalids which are likely to go over the winter. In the experiments recited in But. N. A. as made with chrysalids of *ajax* in the summer of 1871, of several broods of *telamonides* the percentage of butterflies which emerged the same season varied from fifty to sixty, a few dying in chrysalis and the rest over-wintering. In 1870 the proportion of emerging butterflies was larger, but 28 is not an unreasonable number to overwinter out of 122. I conclude, therefore, that the butterflies which have so far emerged this season would naturally have done so, and that the effect of cold has not been to precipitate the emerging of any which would have slept till next spring. And as all which would naturally have emerged this season would have taken the form *marcellus*, the cold has completely changed a large part of these from *marcellus* to *telamonides*, and probably such were from the chrysalids which were subjected to severest cold. The intermediate examples have also changed, but not completely, owing to the lesser degree of cold applied, as before explained; and finally, it seems probable that several chrysalids experienced cold sufficient to retard their emerging and to stunt their growth, but not enough to decidedly change their form. These are the *marcellus*. As to the duration of the chrysalis period, extreme confusion has been produced, so that the emerging, instead of taking place at 14 days after the cold was lessened or withdrawn, as might have been expected, has been protracted through more than two months. In the case of *napi*, as related by Dr. Weismann, where the chrysalids were subjected to cold for three months and then brought into the green-house, the butterflies began to appear in 15 days (or about their natural period), and all that emerged that year did so in the next seven days. In every case the reversion to the winter form was complete; and those chrysalids of the lot which over-wintered all gave the same form in the spring. This it is probable the over-wintering chrysalids of *ajax* will do,—that is, they will give *telamonides* in the spring, and had the degree of cold applied been equal and constant the reversion would probably have been complete. *Telamonides* must be regarded as the primary form of the species. What the position of *Walshii* may be further experiments will perhaps determine.

I append a table showing the dates of emergence of these butterflies:

20th August	1 male		Telamonides.
21st "	1 "	2 females	"
22nd "		1 "	"

24th August..		1 female		Telamonides.
29th " ..	1 male			"
31st " ..		1 "		"
1st Sept.....		1 "		"
2nd "		1 "		"
3rd "		1 "	betw'n Telamonides & Walshii.	
3rd "	1 "			Telamonides.
4th "	4 "	1 "		"
4th "	2 " medium, n'r'st			"
4th "	2 " "			Marcellus.
4th "	2 "			"
5th "	1 "	1 "		Telamonides.
5th "	1 " medium, n'r'st			"
6th "	1 "			Marcellus.
7th "	1 "			Telamonides.
8th "	1 "			Marcellus.
8th "		1 "		Telamonides.
9th "	1 "	1 "	medium, nearest	Marcellus.
13th "	1 " medium, n'r'st			"
13th "	1 " "			Telamonides.
13th "	1 "			Marcellus.
14th "	1 "	1 "	medium, nearest	"
14th "	1 " medium, n'r'st			Telamonides.
15th "	1 "			Marcellus.
16th "		1 "		"
16th "	1 "			Telamonides.
18th "	1 " medium, n'r'st			Marcellus
19th "		1 "		"
20th "	1 "			Telamonides.
24th "	1 "			Marcellus.
30th "		1 "		"
2nd October.		1 "		"
3rd "		1 "	medium, nearest	Telamonides.
8th "		1 "	"	"
16th "		1 "	"	"

RESULT :

Telamonides................	22	spec's....	11 male,	11 female.
" partly Walshii..	1	"		1	"
Medium, nearest Telamonides	7	"	5 male,	1	"
" " Marcellus	9	"	6 "	3	"
Marcellus.................	11	"	5 "	6	"
	50	"	27 "	22	"

LIST OF SPHINGIDÆ AND ZYGÆNIDÆ OCCURRING ON THE ISLAND OF MONTREAL, P. Q.

BY F. B. CAULFIELD, MONTREAL, P. Q.

MACROGLOSSINI.

1. Sesia thysbe Fabr. Not common ; June.
2. Sesia uniformis Gr. & Rob. Not common ; June.
3. Amphion nessus Hubn. Rare ; June and July.

CHŒROCAMPINÆ.

4. Darapsa myron Walk. Common ; June, July.
5. Deilephila chamaenerii Harris. Abundant ; June.

SMERINTHINI.

6. Smerinthus geminatus Say. Not common ; June.
7. " excaecatus Smith. Not uncommon ; June, July.
8. " myops Smith. Very rare.
9. " modestus Harris. Rare.
10. Cressonia juglandis Smith. Not common ; July.

SPHINGINI.

11. Ceratomia amyntor Hubn. Common ; June.
12. Daremma undulosa Walk. Rare.
13. Sphinx chersis Hubn. Common ; June.
14. " drupiferarum Smith. Common ; June, July.
15. " kalmiae Smith. Common ; June, July. I took a specimen of this moth at sugar, July, 1873.
16. " luscitiosa Clem. Very rare ; taken by Mr. Knetzing.
17. " plota Strecker. Rare ; taken by Mr. Knetzing.
18. Agrius eremitus Hubn. Very rare ; taken by Mr. Knetzing.

AEGERIDAE.

1. Aegeria tipuliformis Linn. Not common ; July.
2. " cucurbitae Harris. I was given a specimen of what I take to be this species July, 1875. I unfortunately lost it, and cannot be positive.

Besides these, two other species have been taken here, but are not yet determined.

THYRIDAE.

1. Thyrus maculata Harris. Rare, on bramble blossoms ; June.

ZYGÆNIDAE.

1. Alypia octomaculata Fabr. Not common ; June, July.
2. " Langtonii Couper. Rare ; June.
3. Eudryas unio Hubn. Rare ; July.
4. " grata Fabr. Not uncommon ; July.
5. Scepsis fulvicollis Walk. Very rare ; taken by Messrs. Couper and Pearson ; June, July.
6. Ctenucha virginica Charp. Very common ; end of June, July.
7. Lycomorpha pholus Harris. Not uncommon ; August.

NOTES.—These are all the species that I have seen from this locality. Mr. Knetzing informs me that he found a larva of *Deilephila lineata* Fabr., but did not succeed in rearing it. Mr. Couper was told by a friend last season (1874) that there had been some large caterpillars on a tomato plot in the outskirts of the city. These were probably larvae of *Macrosila quinquemaculata* Haw. I am of opinion that when proper attention has been given to the larval stages of these groups, many species will be added to this list, and many species that we think are rare will prove to be comparatively abundant.

EXCURSION OF THE MONTREAL BRANCH TO CHATEAUGUAY BASIN, ON DOMINION DAY.

BY C. W. PEARSON, MONTREAL, QUE.

Those of the members who accepted Mr. Jack's kind invitation to visit him on Dominion Day, left town on Thursday, the 30th June. by the 5 p. m. train, for Lachine, where they took the boat and had a delightful sail up the Chateauguay River as far as the Basin, where they were met by Mr. Jack, who conducted them to his beautiful residence, where they were warmly welcomed by the rest of his family. After a delicious supper under the shade of the trees, the party amused themselves in pleasant conversation and in preparing sugar for the evening's work. As soon as it began to get dusk, a large number of trees were sugared, and in a short time afterwards moths began to fly in considerable numbers. After a fair evening's work, the party, after a pleasant conversation on Entomology and other subjects, retired to their respective chambers. In the morning, after having participated of the hospitality of their kind host in an excellent breakfast, they started out to inspect the orchad and grounds, and found everything in the most perfect order and free from insect pests, owing to the perseverance and attention that was paid to the collecting of the Clisiocampa rings; during the winter as many as 10,000 having been taken and destroyed, and after this enormous destruction a careful search was made for the caterpillars in the spring Mr. Jack deserves great praise for his attention to those pests, and I am sure he is amply repaid for his energy.

After a ramble through the orchard, the party started in skirmishing order across the fields. Nothing much was done until they got near the bush, when business began to be lively; quite a number of good things were captured. The morning was spent in the woods and fields, and in spite of a little shower that made the party seek shelter under some of the old trees, everything passed off well. A number of larvae were found feeding on the nettle, which were brought home and from which I have raised a lot of *V. Milberti*, *P. atalanta* and two of *Grapta satyrus*. After scouring the woods till noon, the party made their way back to Hillside, where they were again treated to a sumptuous repast, after which they reluctantly took leave of their kind hostess and started to inspect the Colorado beetle, which is doing great damage there. After examining a number of potato patches without success, we at last came upon the enemy. Only one specimen of the perfect insect was found, but the larvae were there in considerable numbers, and a hateful sight they are, covering the plants with their filthy excrements and stripping the stalks of their foliage. After killing a lot of them and bottling some for curiosity, we proceeded down the road leading through the Indian Reserve. This is a capital ground for a collector; insects of all descriptions abound on every side, and I am sure that if it was properly worked up, would yield a great many rarities.

When we arrived at Caughnawauga we found the boat waiting, and, bidding good-bye to Mr. Jack and thanking him for his extreme kind ness, we went on board, and in a short time were landed at Lachine, and thence to Montreal by train, where we arrived about 7 p. m., having enjoyed ourselves thoroughly.

LIST OF LEPIDOPTERA TAKEN AT CHATEAUGUAY BASIN, JUNE 30TH AND JULY 1ST, 1875.

Papilio turnus Linn.
Pieris rapae Linn.
Colias philodice Godart.
Danais archippus Cram.
Argynnis cybele Fab.
" aphrodite.
" myrina.
Phyciodes tharos Boisd. & Lec.
" nycteis.
Grapta comma.
" progne Cram.
Vanessa Milberti Godart.
Pyrameis atalanta Linn.
Limenitis arthemis Drury.
Euptychia eurytus Fab.
Lethe portlandia.
Pararge Boisduvallii Harris.
Lycaena comyntas Godart.
Eudamus tityrus Fab.
Thorybes pylades Scudd.
Hesperia zabulon Boisd.
" leonardus Harris.
" peckius Kirby.
" mystic Scudd.
" taumas.
Ctenucha virginica Charp.
Euchaetes collaris Fitch.
Thyatira expultrix Grote.
Mamestra nimbosa Guen.
Hadena destructor Grote.
" arctica.
" xylinoides Guen.

And several others not yet determined.

BOOK NOTICES.

THE AMERICAN NATURALIST.—This valuable journal has changed hands, and will in future be published by Messrs. H. O. Houghton & Co., Riverside Press, Cambridge, Mass., under the editorial management of A. S. Packard, Jr., assisted by other eminent men of science. The amount of reading matter in each number is to be increased from fifty-six to sixty-four pages.

In addition to much other interesting material, a series of Centennial Articles on botany, zoology, geology and miscroscopy are promised. We bespeak a greatly increased circulation for this valued periodical, and trust that in future its patronage may be in proportion to its great worth. Every naturalist should take it.

Terms 35 cents a number; $4 a year, postage free. We can also offer the following club rates for the *American Naturalist* and CANADIAN ENTOMOLOGIST: $4 gold, $4.50 American currency.

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