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The Canadian Entomologist.

VOL. VI. LONDON, ONT., NOVEMBER, 1874. NO. II

ON ENTOMOLOGICAL NOMENCLATURE.

BY JOHN L. LECONTE, M. D., PHILADELPHIA.

Part I—On the Law of Priority.

Im Ganzen—haltet euch an Worte ! GOETHE.*

The discussions upon the subject of nomenclature in Zoology, and especially in the department of Entomology, have recently become very perplexing to American students. Many who have been unable either by want of time or lack of opportunity, to consult old works, which are to be found in but few libraries, are called upon suddenly to decide for themselves, whether they will or will not adopt changes in the names of some of the most familiar and best known objects.

To all such I have but two words of advice : *Resist innovation*, unless the innovator presents to you the reasons for his proposed change, with such force as to convince your judgment. Disregard the Mephistophelean counsel, in the motto above cited. Use the *words* only to acquire and convey accurately your knowledge of *things* ; but never believe that the word is superior to the thing which it represents. Thus will you avoid scholasticism, one of the great abysses of thought into which the seeker after truth is liable to fall.

With a view to guide the thoughts of those of my readers who have paid heretofore but little attention to this very troublesome subject, in such manner that they may be able to form independent opinions, I have endeavored in this essay to place briefly before them the canons upon which all action in regard to nomenclature are at the present time supposed to be based. And to these canons I have appended short

* *On words* let your attention centre. B. Taylor's Faust, i, 110.

commentaries on the method in which I think they should be executed, in order that we may arrive at permanent and unchangeable results. These canons, as I would express them, are as follows :

1. The binominal system of nomenclature is the only one to be recognized: one word for the genus, and another for the species, to indicate each object.

2. Linnæus was the author of the binominal system.

3. The law of priority must be adhered to, so far as the interests of science make it practicable.

This law renders inviolable the name of every species which has been properly published, and the name of every genus properly defined and exemplified by one or more species.

4. The great number of the organic beings subjected to study has made it necessary, in order to avoid confusion, to increase the binominal name by adding the authority upon which the name either in whole or part rests.

5. In the formation of new names, reference is to be had to classical construction and to the ordinary proprieties of social intercourse.

Since the binominal system is of modern invention, being indeed scarcely more than a century old, and was only gradually introduced even by its author, it is obvious that none of these fundamental canons existed in the minds of the founders of Zoology, and that the appreciation of the necessity of such ordinances has become apparent only in consequence of the confusion occasioned by their non-existence.

The old codes of rules, *Philosophia Botanica* of Linnæus, and its imitation, *Philosophia Entomologica* of Fabricius, do not cover many of the most perplexing cases which have since arisen under these four rules, although, if acted on in good faith, they would have prevented much of the confusion since produced.

Concerning the two old codes I have at present nothing to say, the exhaustive commentary on the rules of Linnæus in the introduction to the *Nomenclator Zoologicus* of Agassiz, leaving, in fact, nothing to be desired.

It is therefore apparent that in applying the four canons, their influence must, like all retro-active laws, commence at certain arbitrary periods, to be determined, not by the judgment of individual investigators, but by

the same authority which fixes the principles themselves, that is : the common consent, expressed in a more or less formal manner, of the majority of those engaged in systematic study relating to the improvement of classification.

Now, the 1st and 2nd canons have been already put in execution by the rule adopted by the British Association, and reaffirmed by the Association of American Naturalists and Geologists, as follows :

“ Rule III. The Committee are of opinion, after much deliberation, that the XIIth edition of the *Systema Naturæ* is that to which the limit of time should apply, viz., 1766.”

This rule was adopted after much discussion regarding the respective claims of the 10th and the 12th edition to be considered as the basis of the system, and I think for wise and sufficient reasons. However that may be, there is no room now for individual difference of action ; it is a law, and must be obeyed by all good citizens in the Republic of Science, until modified or abrogated by an authority equal to that which enacted it.

The third canon respecting the law of priority is also formulated in several rules of the British and American code, but in such manner as to render its application somewhat difficult. The following considerations seem to me of sufficient importance to require a definite decision, when the next opportunity occurs for formal action.

1. It is obvious, on an examination of the works of the earlier authors in Entomology, that they did not attach the same value to the fixity of nomenclature that circumstances have since rendered necessary. Linnæus changed apparently without cause several of the specific names from the 10th to the 12th edition. Previous to that time, he used the generic names in different senses, in different editions, without any explanations. Geoffroy described genera without reference to genera previously established by Linnæus. Fabricius did the same with regard to Geoffroy, and also in some instances changed his genera from 1775 to 1787, without reason, or even reference to the earlier name.

It is not until we come to Olivier that we find in Entomology the law of priority appearing ; and not then as a matter of principle, so much as a courtesy due to the earlier describer.

I would therefore respectfully submit, 1st, that a rigorous application of the law of priority to those authors who did not act in accordance with it, will lead to much confusion ; and it would probably be better, in all

doubtful cases, to restrict its operation to the time since the commencement of Olivier's part of the *Encyclopedie Methodique*, and to accept his decision as final on all cases up to that time, in the same way that the 12th edition of Linnæus is accepted as final on the question of binominal nomenclature.

2. If the authors anterior to the 12th edition are ruled out because of the imperfection of the binominal method up to that time, it would surely be consistent to exclude those after that time who failed to recognize its necessity. Species cannot, of course, be cited from them, for they gave no specific names; but I will go farther, and say that genera ought not to be attributed to them, except so far as to quote them in synonymy for their generic ideas, which were brought into harmony with the system of nomenclature by subsequent authors. They will live in the literature of the science in synonymy, but they have taken no part in the formation of the names of the objects, by which alone we know them and can speak of them, and therefore should not appear as authorities.

The proper application of the fourth canon is attended with still greater difficulty, and I fear that the two sets of opinions regarding the authority to be placed after the binominal name are absolutely irreconcilable. The arguments in favor of the original describer of the species on the one hand, and of the author of the binominal combination adopted on the other hand, are equally strong, perhaps, as regards the convenience of science, and each side has been argued with the utmost ability. I have therefore nothing to say on the subject in the way of argument, and suspect that for some time it must be left to the discretion of each student to decide under which system he can work best. Practically I do not regard it as a matter of any consequence, if each person will *distinctly declare* in his work *which system* he uses. The number of instances in which any confusion can result are few, and the synonymy in catalogues which are always at hand will at once resolve the doubt.

I may be permitted to observe, however, that clearer views of the respective merits of the two methods would prevail, and possibly even some harmonious result more speedily be obtained, if the arguments involved less discussion of purely personal interests. It would seem from some expressions of opinion I have seen, but which I forbear to refer to more definitely, that there are those that believe that one main object of descriptive natural history is to give the authors a sort of proprietary

interest in the species to which they affix names. The two methods of reference to authors would lead, therefore, on the one hand, to hasty and vague descriptions of species, on the other to arbitrary and unnecessary changes in genera. Such ideas are really aspersions on the motives of the great professors of unremunerative labor, upon whom science chiefly depends for her advancement. The good and true laborers are many; the small and mean minds, who feel honored at being quoted even in synonymy, are few. I think, therefore, that the harm to be done by adhering to either of the two methods is greatly exaggerated.

I would prefer to believe that the somewhat passionate line of argument occasionally indulged in, arises rather from a mental fault which is too common in this age, which prevails in all classes and in all pursuits—the undue importance given to the claiming of supposed rights, over the performance of fixed and definite duties. Of clamor for rights, even in countries where there is no oppressing class, we hear a great deal; of appeals for the rigid keeping of obligations we hear very little.

It is the privilege, with the facilities for publication now afforded by learned societies, of every careful observer of nature to contribute valuable material for the progress of the branch of science which he is capable of cultivating. *It is his duty* to put his contributions to knowledge in such a form as to be most easily available to his brothers in science. Whether his name remains connected permanently with his observation or not is a matter of small importance; he has done his duty in increasing the power of work of his colleagues.

In this connection I would observe that it is only in descriptive Natural History, the lowest and most routine work that a man of science has to perform, that any association of names with results is possible. In all other and higher departments of knowledge, such as Newton with gravitation, Young with light, Franklin with atmospheric electricity, Faraday, Henry, Arago, Ampere and Jacobi with dynamical electricity, Agassiz with glacial action; or, to exemplify from our own departments, Linnæus, Jussieu, Cuvier and Geoffroy, all these men are historically eminent for their labors, far more than for attaching their names to the objects of their study. With such examples of high and honest effort, to be imitated by us in proportion to our respective abilities, it is surely an ignoble ambition, and certainly an uncommon one, that would aim at distinction by having the name printed in association with a weed, or a bug, or a bone.

The multitude of new objects is the great curse of Natural History at the present time. When they are nearly all described and named, so

that they may be recognized, a period of more rapid and healthy progress will commence. The attention of the lovers of nature will then be free to observe the habits and to study more minutely the structure of the different species. Classification and economic science will advance together to the perfection which will reward the future students.

One more subject remains to be treated, and I have done. It is one that I approach with hesitation, and even with pain. The recommendations contained in the British American Code, for the future guidance of naturalists in respect to nomenclature, are carefully drawn, and if faithfully and prudently regarded, would leave nothing to be desired.

Unfortunately, under the influence of personal peculiarities, the excitement of political struggles, or the uncongeniality of religious associations, the contributors to scientific literature are sometimes led to forget the laws of good breeding, which are binding upon all civilized men, and should be particularly so upon those addicted to so noble a pursuit as the study of nature.

Under these exaltations of brain, names are sometimes proposed which are offensive* in the highest degree. It is useless to reason with such persons on the impropriety of their conduct, or the irrelevancy of proclaiming opinions which have no place in science, for their minds are occluded against all such appeals to their better nature. What shall be done with such names? It is a question which concerns not only the systematist, but every collector, every writer, indeed, who may have occasion to use an illustration from Natural History. I therefore invite the fullest and most democratic expression of opinion.

INSECTS AND FLOWERS.—I have observed this spring that the bees extract honey from the flowers of the *Wisteria* by drilling a hole through the calyx. I have seen the big bumble-bees drilling the holes, and the honey-bees making use of these holes. Whether the latter have strength to bore the holes I am not sure; but it is curious that they should not treat the honeysuckle in the same way. It would be easier to pierce the corolla of that flower than the tough calyx of *Wisteria*, and it would yield a more abundant supply of nectar. No doubt there is some reason why they do not, and perhaps you can inform me what it is.—*C. T. in Science Gossip.*

* [The author here evidently alludes to such names as *Plecoma Staff*, *Eudæmonia Jehovah* and others of the same nature.]

ON THE INSECTS MORE PARTICULARLY ASSOCIATED
WITH *SARRACENIA VARIOLARIS* (*Spotted Trumpet-Leaf*)*

BY CHAS. V. RILEY, ST. LOUIS, MO.

The insect-catching powers of those curious plants, the Fly-traps (*Dionaea*), the Sun-dews (*Drosera*) and the Trumpet-leaves (*Sarracenia*) have always attracted the attention of the curious, but renewed interest has been awakened in them by virtue of the interesting experiments and observations on their structure, habit and function, that have lately been recorded, and especially by the summing up of these observations in some charming papers by Prof. Asa Gray, which recently appeared in *The Nation* and *The New York Tribune*, under the title of "Insectivorous Plants."

Through the courtesy of Dr. J. H. Mellichamp, of Bluffton, and of H. W. Ravenel, of Aiken, S. C., who have sent me abundant material, I am able to submit the following notes of an entomological bearing, on the Spotted Trumpet-leaf (*Sarracenia variolaris*), which must henceforth rank with the plants of the other genera mentioned as a consummate insect catcher and devourer.

The leaf of *Sarracenia* is, briefly, a trumpet-shaped tube, with an arched lid, covering, more or less completely, the mouth. The inner surface, from the mouth to about midway down the funnel, is covered with a compact, decurved pubescence, which is perfectly smooth and velvety to the touch, especially as the finger passes downward. From midway it is beset with retrorse bristles, which gradually increase in size till within a short distance of the bottom, where they suddenly cease, and the surface is smooth. There are also similar bristles under the lid. Running up the front of the trumpet is a broad wing with a hardened or ventral side border, parting at the top and extending around the rim. Along this border, as Dr. Mellichamp discovered, but especially for a short distance inside the mouth, and less conspicuously inside the lid, there exude drops of a sweetened, viscid fluid, which, as the leaf matures, is replaced by a white, papery, tasteless, or but slightly sweetened sediment or efflorescence; while at the smooth bottom of the pitcher is secreted a limpid fluid possessing toxic or inebriating qualities.

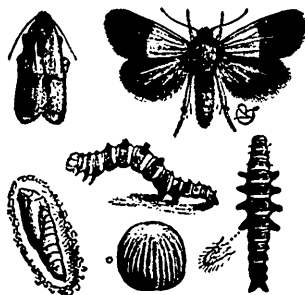
* Read before the American Association for the Advancement of Science, at the late meeting at Hartford.

The insects which meet their death in this fluid are numerous and of all orders. Ants are the principal victims, and the acidulous properties which their decomposing bodies give to the liquid doubtless render it all the more potent as a solvent. Scarcely any other Hymenoptera are found in the rotting mass, and it is an interesting fact that Dr. Mellichamp never found the little nectar-loving bee or other Mellifera about the plants. On one occasion only have I found in the pitcher the recognizable remains of a *Bombus*, and on one occasion only has he found the honey-bee captured. Species belonging to all the other orders are captured, and among the larger species that I have most commonly met with, which, from the toughness of their chitinous integument, resist disorganization and remain recognizable, may be mentioned *Asaphes memnonius* and *Euryomia melancholica* among Coleoptera, *Pentatoma lugens* and *Orsilochus variabilis*, var. *complicatus* among Heteroptera; while katydids, locusts, crickets, cockroaches, flies, moths, and even butterflies, and some Arachidna and Myriapoda, in a more or less irrecognizable condition, frequently help to swell the unsavory mass.

But while these insects are decoyed and macerated in order, as we may naturally infer, to help support the destroyer, there are, nevertheless, two species which are proof against its siren influences and which, in turn, oblige it either directly or indirectly to support them.

The first is *Xanthoptera semicrocea* Guen., a little glossy moth, which may be popularly called the Sarracenia moth. It is strikingly marked

Fig. 25.



XANTHOPTERA SEMICROCEA.—a, egg, enlarged, the natural size indicated at side; b, c, larva, back and side views; d, chrysalis; e, moth, normal form, with wings expanded; f, pale variety, with wings closed.

with gray-black and straw-yellow, the colors being sharply separated across the shoulders and the middle of the front wings. This little moth walks with perfect impunity over the inner surface of the pitcher, which proves so treacherous to so many other insects. It is frequently found in pairs within the pitchers soon after these open, in the early part of the season or about the end of April. The female lays her eggs singly, near the mouth of the pitcher, and the young larva, from the moment of hatching, spins for itself a carpet of silk, and very soon closes up the mouth by drawing the rims together and covering them with a delicate, gossamer-like web, which effectually debars all small outside intruders. It then frets the leaf

within, commencing under the hood and feeding downward on the cellular tissue, leaving only the epidermis. As it proceeds, the lower part of the pitcher above the putrescent insect collection becomes packed with ochreous excrementitious droppings, and by the time the worm has attained its full size the pitcher above these droppings generally collapses. This worm, when full grown, is beautifully banded transversely with white and purple or lake red, which Dr. Mellichamp poetically likens in brightness to the Tyrian dye. It is furthermore characterized by rows of tubercles, which are especially prominent on the four larger legless joints. It is a half looper, having but six prolegs, and keeps up, in travelling, a constant, restless, wavering motion of the head and thoracic joints, recalling *paralysis agitans*. The chrysalis is formed in a very slight cocoon, usually just above or within the packed excrement. The species, kindly determined by Mr. A. R. Grote, was many years ago figured by Abbot, who found it feeding on *Sarracenia variolaris*, in Georgia. Guenée's descriptions were made from these figures, for which reason I have made some descriptive notes from the living material.* The species feeds alike on *S. variolaris* and *S. flava*, and there are at least two broods each year, the first brood of larvæ being found during the early part of May, the second toward the end of June, and disappearing with the dying of the leaves.

The second species is a still more invariable living accompaniment of both kinds of *Sarracenia* mentioned. By the time the whitish efflorescence shows around the mouth of the pitcher, the moist and macerated insect remains at the bottom will be found to almost invariably contain a single whitish, legless grub or "gentle," about as large round as a goosequill, tapering to the retractile head, which is furnished with two curved, black, sharp hooks, truncated and concave at the posterior end of the body.

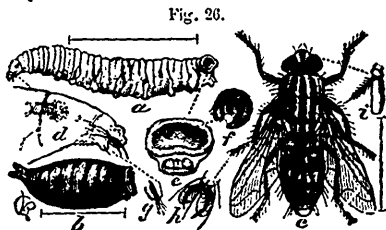


FIG. 28.
SARCOPHAGA SARRACENIE.—a, larva; b, pupa; c, fly, the hair lines showing average natural lengths; d, enlarged head and first joint of larva, showing curved hooks, lower lip (g), and prothoracic spiracle; e, end of body of same, showing stigmata (f) and prolegs and vent; h, tarsal claws of fly with protecting pads; i, antenna of same. All enlarged.

This worm riots in the putrid insect remains, and when fed upon them to repletion, bores through the leaf just above the petiole and burrows

* These will be found in the Transactions of the St. Louis Academy of Science.

into the ground. Here it contracts to the pupa state, and in a few days issues as a large two-winged fly, which I have described (*loc. cit.*) as *Sarcophaga sarracenia*—the Sarracenia Flesh-fly.

The immense prolificacy of the flesh-flies, and the fact that the young are hatched in the ovaries of the parent before they are deposited by her on tainted meat and other decomposing or strong-smelling substances, have long been known to entomologists, as has also the rapid development of the species. The viviparous habit among the Muscidæ is far more common than is generally supposed, and I have even known it to occur with the common house-fly, which normally lays eggs. It is also possessed by some Cæstridæ, as I have shown in treating of *Cæstrus ovis*, the Sheep Bot-fly,*

But the propensity of the larvæ for killing one another, and their ability to adapt themselves to different conditions of food supply are not sufficiently appreciated. I have long since known, from extensive rearing of parasitic Tachinidæ, that when, as is often the case, a half dozen or more eggs are fastened to some caterpillar victim only large enough to nourish one to maturity, that they all hatch and commence upon their common prey, but that the weaker eventually succumb to the strongest and oldest one, which finds the juices of his less fortunate brethren as much to his taste as those of the victimized caterpillar. Or, again, that where the food supply is limited in quantity, as it often is and must be with insects whose larvæ are parasitic or sarcophagus, such larvae have a far greater power of adapting themselves to the conditions in which they find themselves placed, than have herbivorous species under like circumstances.

Both these characteristics are strongly illustrated in *Sarcophaga sarracenia*. Several larvae, and often upward of a dozen, are generally dropped by the parent fly within the pitcher; yet a fratricidal warfare is waged until usually but one matures, even where there appears macerated food enough for several. And if the Xanthoptera larva closes up the mouth of the pitcher ere a sufficient supply of insects have been captured to properly nourish it, this *Sarcophaga* larva will nevertheless undergo its transformations, though it sometimes has not strength enough to bore its way out, and the diminutive fly escapes from the puparium, only to find itself a prisoner unless deliverance comes in the rupture or perforation of the pitcher by the moth larva or by other means. This rupturing of the

* 1st Mo., Ent. Rep., p. 165.

pitcher does not unfrequently take place, for Dr. Mellichamp writes under date of June 27, as follows: "Most old leaves now examined—I might almost say all—instead of being bored, seem ripped or torn, as if by violence, apparently from without. You see occasionally shreds of the leaf hanging. Surely the legless larva of *Sarcophaga* cannot do this! What then—toads, or frogs, or crawfish abounding in these moist, pine lands? or rather is not the fat maggot the occasion of the visits of the quail, which lately I have observed here?"

These two insects are the only species of any size that can invade the death-dealing trap with impunity while the leaf is in full vigor, and the only other species which seem at home in the leaf are a minute pale mite belonging apparently to *Holothyrus* in the Gamasidæ, and which may quite commonly be found crawling within the pitcher; and a small Lepidopterous leaf-miner, which I have not succeeded in rearing. There must, however, be a fifth species, which effectually braves the dangers of the bottom of the pit, for the pupa of *Sarcophaga* is sometimes crowded with a little Chalcid parasite, the parent of which must have sought her victim while it was rioting there as larva.

No other insect, so far as we now know, can crawl up the slippery belt, but tumble into the tube and there meet their death.

Certain questions very naturally present themselves here: First, What gives the flesh-fly more secure foothold on the slippery pubescence than the common house-fly exhibits? Second, What enables the larva of the flesh-fly to withstand the solvent property of the fluid which destroys so many other insects? Third, What gives the *Sarracenia* moth and its larva similar security? I can only offer, in answer, the following suggestions: The last joint of the tarsus of the common house-fly has two movable, sharp-pointed claws, and a pair of pads or "pulvilli." These pads were formerly supposed to operate as suckers, and all sorts of sensational accounts of this wonderful sucker have been given by popular writers, who forgot that there are any number of minute insects having no such tarsal apparatus, which are equally indifferent to the laws of gravitation so far as walking on smooth, upright surfaces, or on the ceiling, is concerned. In reality, these pads are thickly beset on the lower surface with short hairs, most of which terminate in a minute expansion kept continually moist by an exuding fluid—a sort of perspiration. Take the soft human hand, moistened by perspiration or other means, and draw it, with slight pressure, first over a piece of glass or other highly-polished surface, and then over something that has a rougher surface, such as a

planed board, a papered wall, or a velvety fabric, and you will experience much greater adhesion to the smoother objects, and may understand the important part which these moist pads play in the locomotion of the fly. They also act, in part, like the cushions of a cat's paw in protecting and preventing abrasion of the claws, which are very useful on the rougher surfaces, where the pads are less serviceable.

Now, compared with *Musca domestica*, the claws of *Sarcophaga sarra-
cenia* are much the longest and strongest, and the pads much the largest, presenting three or four times the surface. These differences are, I think, sufficient to explain the fact that while the common fly walks with slippery and unsteady gait on the smooth pubescence (the retrorse nature of this pubescence sufficiently explaining the downward tendency of the movement), its sarcophagus congener manages to get a more secure footing; for not only does the latter present a larger adhesive surface, but the longer claws are more likely to reach beyond the pubescence and the bristles, and fasten to the cellular tissue of the leaf beyond. Moreover, *Sarcophaga* is more thickly beset with stiff, spinous bristles than *Musca*, and Dr. Mellichamp says that when disturbed it buzzes violently about, just as if an animated sheep-bur had fallen into the tube—not apt to go down, because it will hitch and stick, and finally, by main force, it generally emerges, but once in a while also succumbs.

In answer to the second question I can only say that there is nothing exceptional in the power of the larva to withstand the solvent quality of the fluid; it is, on the contrary, in accordance with the facts known of many species of Muscidae and Cæstridae, some of which, like the well-known horse bot, revel in a bath of chyme, while others are at ease in the intestinal heat of other warm-blooded animals. It is also well known that they will often live for hours in strong liquids, such as alcohol and turpentine.

In answer to the third question, the moth is doubtless assisted in walking within the tube by the spines and spurs on the legs, which it, in common with most other moths, possesses—the tarsi in Xanthoptera being armed with spines, and the spurs being quite long, and in *semicrocca* usually shod at tip with a corneous point. Its larva overcomes the treacherous surface by either carpeting it with silk or destroying it.

CONCLUSION.

To one accustomed to seek the why and wherefore of things, the inquiry very naturally arises as to whether Xanthoptera and *Sarcophaga*

play any necessary or important role in the economy of *Sarracenia*. Speaking of the *Sarcophaga* larva, Mr. Ravenel asks, "May he not do some service to *Sarracenia* as *Pronuba* does to *Yucca*?" And if so, may not all this structure for the destruction of insects be primarily for his benefit? Can he be merely an intruder, sharing the store of provision which the plant, by ingenious contrivance, has secured for itself, or is he a welcome inmate and profitable tenant? Self-fertilization does not take place in *Sarracenia*, and the possibility that the bristly flesh-fly aids in the important act of pollination, lends interest to the facts. No one has witnessed with greater pleasure than myself the impulse which Darwin has of late years given to such inquiries; but we should be cautious lest the speculative spirit impair our judgments or ability to read the simple lesson of the facts. My own conclusions summed up are:

First: There is no reason to doubt, but every reason to believe, since the observations of Dr. Mellichamp, that *Sarracenia* is a truly insectivorous plant, and that by its secretions and structure it is eminently fitted to capture its prey.

Second: That those insects most easily digested (if I may use the term), and most useful to the plant, are principally ants and small flies, which are lured to their graves by the honeyed path, and that most of the larger insects, which are not attracted by sweets, get in by accident and fall victims to the peculiar mechanical structure of the leaf.

Third: That the only benefit to the plant is from the liquid manure resulting from the putrescent captured insects.

[Mr. Ravenel, in making a transverse section near the base of the young leaf, noticed large tubular cells passing down through the petiole into the root, and much of the liquid manure may possibly pass through these into the root stalk.]

Fourth: That *Sarcophaga* is a mere intruder, the larva sponging on and sharing the food obtained by the plant, and the fly attracted thither by the strong odor, as it is to all putrescent animal matter or to other plants, like *Stapelia variegata*, which give forth a similar odor. There is nothing to prove that it has anything to do with pollination, and the only insect that Dr. Mellichamp has observed about the flowers with any frequency, is a Cetonid beetle—the *Euryomia melancholica*, which, with other species of its genus, is commonly found on many different flowers.

Fifth: That Xanthoptera has no other connection with the plant than that of a destroyer, though its greatest injury is done after the leaf has

performed its most important functions. Almost every plant has its peculiar insect enemy, and Sarracenia, with all its dangers to insect life generally, is no exception to the rule.

Sixth: That neither the moth nor the fly have any structure peculiar to them that enables them to brave the dangers of the plant, beyond what many other allied species possess.

PRELIMINARY CATALOGUE OF THE NOCTUIDÆ OF CALIFORNIA.

Part II.

BY AUG. R. GROTE,

Curator of Articulata, Buffalo Soc. of Natural Sciences.

10. *Agrotis Cochranii* Riley. (See ante p. 155).

The specimens are hardly to be distinguished from Eastern material; they are perhaps a little larger, and of a little different tone of color. My determination of this species as *lycarum* H.-S., based on a figure, is probably incorrect. It seems possible that Harris has described *A. Cochranii* under the name *messoria*, which should then be retained. More material of *A. fuscigerus* (ante No. 15) shows that this is a good but variable species, both in size and color. There is always a uniformity in the disposition of the ground tint over the primaries above, and usually the broad inner lunulations of the t. p. line and the median shade are characteristic. Some specimens have the hind wings of a pale yellowish testaceous, with double subterminal shade lines visible.

19. *Dianthoecia niveiguttata* (Grote). (Ante p. 156.)

In my ♀ specimen the ovipositor is apparently broken off.

28. *Agrotis alternata* Grote.

Mendocino, Mr. Behrens, June. Nos. 4 and 164. The California specimens vary in distinctness of the markings on the forewings as well as in the general color. One has the primaries entirely plain and unicolorous. I do not think there are grounds for suspecting a different species.

29. *Agrotis innotabilis* Grote, Proc. Ac. N. Sci., Phil., 1874.
Sauzalito, Mr. Behrens, August.

30. *Dianthoecia pensilis* Grote, Proc. Ac. N. Sci., Phil., 1874.

Sauzalito, Mr. Behrens, Aug., Sept. 11th, Nov., both sexes. Nos. 181 and 183, 123, 147. The specimens are less brightly gray than those from Victoria. The male has the primaries more uniformly broken up with reddish. The white shade above internal angle is indicated by the pallor of an angulation of the subterminal line.

31. *Hadena arctica* (Boisd.), Bull. B. S. N. S., 1, p. 42.
Sierra Nevada, Hy. Edwards, Esq., No. 3513.

32. *Hadena Bridghami* (G. & R.) l. c. p. 142.
Sierra Nevada, Hy. Edwards, Esq., No. 3510.

33. *Hadena devastator* (Brace.)
California, Hy. Edwards, Esq. Mr. Behrens, No. 193.

34. *Hadena lateritia* (Hubn.) This is *H. dubitans* Walk., of my 'List.
Sierra Nevada, Hy. Edwards, Esq., No. 3512.

35. *Hadena genialis* Grote, List N. Am. Noct., p. 66.
California, Mr. Behrens, Nos. 7 and 64.

36. *Hadena castanea* Grote, Bull. B. S. N. S., 2, p. 156.
California, Mr. Behrens, No. 10 (red label).

37. *Hadena albina* Grote, l. c. p. 157.
California, Mr. Behrens ; Sauzalito, May 15th, No. 78.

38. *Hadena curvata* Grote, l. c. p. 157.
California, Mr. Behrens, Nos. 70 and 99.

39. *Hadena divesta* Grote.

A moderate, slender bodied species, resembling somewhat in its colors *Dianthoecia pensilis*. Eyes naked; abdomen strongly tufted dorsally. Fore wings dark gray, with the basal field shaded with carneau ochrey; a patch above the submedian dash and extending between the spots, and the subterminal line shaded with the same color. There is a narrow black basal ray. Ordinary spots large and wide, concolorous, the blackish median shade marked on costal region between them. Median space wide, owing

to the outward removal of the t. p. line; the latter somewhat as in *H. curvata*, but much more removed beyond the reniform. T. p. line angulated opposite the cell, geminate, even in its course, its inner line forming a regular series of slight lunulations; the filling in of the line becomes white inferiorly. Subterminal line preceded medially by cuneiform black marks. Hind wings fuscous, darker outwardly, with a transverse shade line without the middle. Beneath fuscous, with even common line and discal spots.

Expanse 32 m. m. Sauzalito, Aug. 12th, Mr. James Behrens, No. 145.

40. *Hadena marina* Grote, List N. Am. Noct., p. 67.
California, Mr. Behrens, No. 68.

41. *Hadena flava* Grote, Trans. Am. Ent. Soc., 5.
Victoria, Mr. Crotch; Colorado, Mr. Mead.

42. *Morrisonia peracuta* Morr., Bull. B. S. N. S., 2, p. 114.
California?

43. *Eupsephopactes procinctus* Grote, Bull. B. S. N. S., 1, p. 138, pl. 4, fig. 6.

California, Hy. Edwards, Esq., No. 73; Mr. Behrens.

44. *Hydrocia nictitans* var. *erythrostigma* (Haw.)
California, Mr. Behrens, July 30th, No. 165.

45. *Ochria sauzalita* Grote.

Sauzalito, September 17th, Mr. Behrens, No. 161; Hy. Edwards, Esq. No. 135.

This species has a distinct clypeal tubercle, and is therefore congeneric with the European *flavago*. It belongs to *Gortyna* of Lederer, but not of Hubner, whose genus is equivalent to *Hydracia* "B" of Lederer. For the European *flavago*, I have shown that *Ochria* Hubn. must be retained. I have separated *Hydracia* "A." of Lederer under Guenée's name, but I am of opinion that for this genus, of which the type is *nictitans*, the term *Apamea* must be retained. It is not a little singular that the species which most nearly resembles *flavago* in America, viz., *cataphracta* Grote, should have no clypeal tubercle, and therefore must be referred to a different genus. In my "List" I have erroneously referred *Gortyna purpurifascia*, an Eastern species without the tubercle, to *Ochria*, which, so far should only contain *O. sauzalita*. The Cal. species differs,

from *G. purpurifascia* by the t. p. line being slightly arcuate superiorly. In size and ornamentation the Californian species rather resembles *rutila*, which wants the tubercle.

46. *Admetovis oxymorus* Grote, Bul. B. S. N. S., 1, p. 133, pl. 4, fig. 5. Sierra Nevada, Hy. Edwards, Esq., No. 2733.
47. *Heliophila pallens* [Linn]. California, Mr. Behrens, No. 10 [red label].
48. *Heliophila phragmitidicola* [Guenee]. Sauzalito, Sept. 25th, Mr. Behrens, No. 169.
49. *Ufeus plicatus* Grote, Proc. Bost. Soc. N. H., 16, p. 241. California, No. 4414, Hy. Edwards, Esq.
50. *Zosteropoda hirtipes* Grote, List N. Am. Noct., p. 68. California, Hy. Edwards, Esq., No. 3484.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KENTUCKY.

(Continued from page 196.)

ASPIDISCA.

A. diospyriella. N. sp.

This species was bred from minute mines in the leaves of Persimmon trees (*Diospyros virginiana*), gathered in great abundance at the "Bee Spring" camp of the Kentucky Geological Survey, in Edmondson County, a few miles west of the Mammoth Cave. I have never met with it in Northern Kentucky, where the Persimmon tree also grows, but is comparatively rare.

Head and thorax, and a little more than the basal half of the primaries pale leaden gray, with a metallic, almost silvery lustre; antennae fuscous above, silvery fuscous below; just behind the middle of the wing are two

silvery streaks, one on the costal, and one on the dorsal margin, the latter a very little before the former, and both strongly dark margined before and behind, their anterior dark margins meeting just behind the middle of the wing, where they are somewhat posteriorly angulated. The silvery streaks are not confluent, being separated by the anterior point of a dark brown dorsal patch, placed behind the dorsal streak. This dark brown dorsal patch is common to all species of the genus now known, and in all of them it forms the posterior margin of dorsal silvery streak, and becomes confluent with the posterior dark margin of the costal streak also; the anterior dark margins of both silvery streaks are margined faintly before with pale golden, much less distinct and covering much less space than in *splendoriferella*; behind the posterior dark margin of the costal streak is a small golden patch, as in *splendoriferella*, containing a small black dorsal streak (or, perhaps more correctly, margined by it.) In perfect fresh specimens of *splendoriferella* the extreme costa in this golden spot is always more or less streaked longitudinally with dark brown scales; these dark brown streaks are absent in this species, and besides, in *splendoriferella* the anterior dark margins of the costal and dorsal silvery streaks are not confluent and posteriorly angulated as in this species, but are separated by a narrow golden line, which is carried backwards between the silvery streaks themselves, thus connecting the golden patch before the streaks with the costal golden spot behind the streaks; in this species they are not so connected. Mr. Stainton, in a note on *splendoriferella*, in his edition of the Clemens papers, states that the silvery costal and dorsal streaks are confluent in that species. I have never found them so, but always under a good lens I find them separated by the narrow golden line as above stated. In *splendoriferella* the dark brown dorsal spot is separated from the fan-shaped apical spot by a narrow projection of the costal golden spot, which extends to a small spot of silvery scales on the dorsal edge of the apical spot; but in this species this golden projection is only represented by a small golden spot, which is separated from the costal golden one by a narrow blackish line, which extends from the brown dorsal spot to a small silvery spot at the beginning of the fan-shaped apical spot. As in all the other species, there is also a small silvery spot on the costal side of the fan-shaped apical brown patch, as well as one on the dorsal side, and the one at its beginning. The fan-shaped apical brown patch is traversed across its middle (between the two silvery spots) by a streak of paler brown, thus dividing it into two velvety black (rather than brown) spots. As in *splendoriferella*, there is a narrow brown

line from the apex of the wing to the apex of the ciliae, and as in that species, the ciliae are yellowish rather than yellowish brown, as Dr. Clemens describes them. Dr. Clemens' statement that in *splendoriferella* there is a black apical spot, with metallic scales, in its centre, also seems to me misleading; there is only the fan-shaped apical black spot divided across its centre by a paler brown streak, at each end of which is a minute speck of silvery scales, and there is the third one at the beginning or handle of the fan-shaped spot—and this is true of all the species. I have not been able to detect separate from the brown dorsal patch what Dr. Clemens calls "a blackish brown hinder marginal line in the ciliae" in *splendoriferella*, unless by it is meant the brown band which crosses the fan-shaped spot; but by careful observation with a lens, two such lines may be found in the dorsal brown patch, darker than the surrounding portions, but which I have not been able to detect in *diospyriella*. The basal portion of the wing is more silvery than in *splendoriferella*, and the apical portion is much less golden, so that in this species the dark brown and silvery hues prevail over the golden, while Dr. Clemens was perhaps right in calling golden the ground color of the apical part of the wing in *splendoriferella*.

In *juglandiella* the apical part of the wing is more golden than in *diospyriella*, but less so than in *splendoriferella*. It has, like *diospyriella*, the anterior dark margins of the two silvery streaks confluent, and the silvery streaks are separated in *juglandiella* as just described in *diospyriella*. But, as in *splendoriferella*, the golden costal patch sends off towards the dorsal ciliae and to the little silver spot which on that side margins the fan-shaped spot, a short streak which is not cut off from the rest of the golden patch by a process from the costal brown spot to the fan-shaped spot, as we have seen is the case with *diospyriella*. The case of *juglandiella*, like that of *diospyriella*, is nearly oval, whilst that of *splendoriferella* is rather trapezoidal. But *juglandiella* is but little smaller than *splendoriferella*, whilst *diospyriella* is but little larger than *salicifoliella*. Some of the points of difference that I have mentioned are only brought out by the use of the compound microscope.

Considering the near relationship of the food plants (Walnut and Hickory), it is strange that I have not sooner thought that *juglandiella* may be *luciflua* Clem. It may be, though I have not been able to recognize it in Dr. Clemens' description. Indeed, it seems to me that *luciflua* and *A. ella* are nearer to each other, though I have not been able to recognize *A. ella* in Dr. Clemens' description of *luciflua*. I

am, however, satisfied that *A. ella* must either be *lucifuella* or the unknown species which mines *Ostrya* leaves. I have bred *ella* frequently from cases found adhering to various trees, but I have not been able to breed either the Hickory species (*lucifuella*) or the unknown *Ostrya* species. *A. ella* must be one of these, because the thoroughness of my search satisfies me that there are no other mines of this genus to be found in this region, except those of *splendoriferella* and *saliciella*, which are sufficiently distinct, and both of which I have bred. If *juglandiella* is *lucifuella*, then *ella* must be the *Ostrya* miner. *Splendoriferella* is decidedly the largest species that I have seen, but Dr. Clemens states that *lucifuella* is a little larger than it. This, however, is probably a mistake, as the cases that I have seen of *lucifuella* are even smaller than those of *splendoriferella*, and very greatly resemble those of *A. ella*, while also the vegetable hairs on the cases of *A. ella* appear to be identical with those on Hickory leaves.

The minute size of *diospyriella* is one of the strongest reasons for considering it a distinct species. *Al. ex.* $\frac{5}{8}$ inch.

MISCELLANEOUS.

DRYOCAMPA RUBICUNDA.—About four or five years ago I found a dead male specimen of this rare moth under an apple tree in our garden, and although a good deal rubbed, it was perfectly recognizable. This is, I am informed, the only instance of this moth having been taken in this city.—H. H. LYMAN, Montreal, P. Q.

DR. A. S. PACKARD, of Salem, Mass., is about to publish his long projected monograph of Geometrid moths, and designs giving a figure of each species. To make the work as complete as possible, specimens of this family are earnestly desired for study, and will be carefully returned, or other specimens sent in exchange.

DEATH OF FRANCIS WALKER.—We have just received the sad intelligence of the death of this distinguished Entomologist, who died at his residence, Elm Hall, Wanstead, on the 5th of October. A more extended notice of him will appear in our next.