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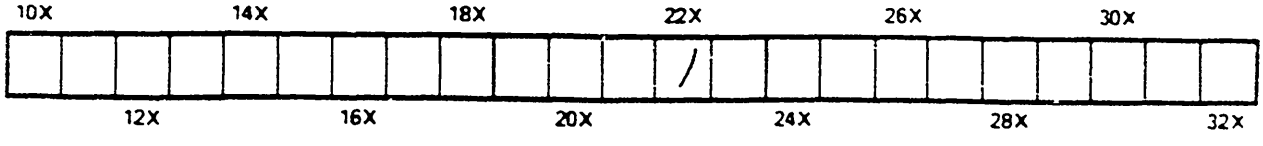

The Canadian Entomologist.

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ANNUAL MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The annual gathering of the Entomologists of North America, in connection with the meeting of the A. A. A. S., took place this year at Boston, Mass., and was the most important that has ever been held, both as regards the largeness of the attendance, the number and value of the papers read, and also as regards the general interest taken in the proceedings. So highly indeed was it esteemed that the Standing Committee of the Association formed the Club into a Sub-section of Section B., (Zoology, Botany, &c.), and will publish its proceedings in the annual volume of transactions.

The first session was held in the lecture-room of the Museum of the Boston Society of Natural History at 2 o'clock p. m., on Tuesday, August 24th, 1880; the President, S. H. Scudder, of Cambridge, Mass., in the chair. There were over sixty persons present during this first meeting, and at least one hundred in all must have attended the various sessions of the Club. Amongst those present were the following Entomologists of note:—Dr. J. A. Lintner, Dr. John L. LeConte, Dr. John G. Morris, Prof. C. V. Riley, Dr. H. A. Hagen, A. R. Grote, Prof. Packard, S. S. Haldeman, B. P. Mann, Prof. C. H. Fernald, Prof. A. J. Cook, Dr. C. S. Minot, Rev. H. C. McCook, E. P. Austin, E. L. Graef, H. F. Bassett, J. D. Putnam, Dr. E. L. Mark, E. Burgess, Dr. Martin, J. G. Henderson, Prof. Morse, Dr. Hoy, O. S. Westcott and J. H. Emerton. The Entomological Society of Ontario was represented by the Rev. C. J. S. Bethune, of Port Hope, and H. H. Lyman, of Montreal.

After the meeting had been called to order, the President, Mr. Scudder, delivered the following address on "Problems in Entomology":—

ANNUAL ADDRESS OF THE PRESIDENT.

It is the good fortune of your President on this occasion to welcome you to his native heath, where our favorite science has been longer, more uninterruptedly, and, perhaps, more zealously cultivated, than anywhere

else in the New World. Here, in the last century, Peck studied the Cankerworm and the Slug-worm of the Cherry, and, in late years, *Rhynchaenus*, *Stenocorus*, and *Cossus*—all highly destructive insects. Here lived Harris, who cultivated entomology in its broadest sense, and whose classic treatise was the first important Government publication on injurious insects. Here, to-day, we have two associations for our work, consisting, it will be confessed, of nearly the same individuals, and not many of them, but meeting frequently—one in Boston, the other in Cambridge. Harvard acknowledges the claims of our study in supporting not only an instructor in entomology at its Agricultural School, but a full professor of the same in the University at large.

Harris attributed to Peck his special interest in entomology, and his first paper, that on the Salt-marsh Caterpillar, appeared in the *Massachusetts Agricultural Repository* only four years after Peck's last, in the same magazine, on Cherry and Oak Insects. How many of us have drawn our first inspirations from Harris? Yet probably not one of our local entomologists ever saw him. The general direction of Harris's studies doubtless arose from the predilections of his instructor; and the unprecedented growth of economic entomology in this country, where it flourishes as nowhere else, must be credited primarily to the influence of Harris's work. With every temptation which the wealth of new material about him could give, or which a very extensive correspondence with naturalists devoting themselves almost exclusively to systematic work, like Say, would naturally foster, he wisely followed the bent given his studies by his early training under Peck, and left a better example and a more generous and enduring influence.

In our own day, the spreading territory of the United States, the penetration of its wilds, and the intersection of its whole area by routes of travel, the wider distribution and greatly increased numbers of local entomologists, as well as the demand for our natural products abroad, have set also before *us* the same temptation to study only new forms and to cultivate descriptive work, to the neglect of the choicer, broader fields of an ever-opening science. It is this danger to which I venture briefly to call your attention to-day, not by way of disparaging the former, but rather in the hope that some of our younger members, who have not yet fallen into the ruts of work, may be induced to turn their attention to some of the more fruitful fields of diligent research.

We should not apply the term descriptive work merely to the study of

the external features of insects. The great bulk of what passes for comparative anatomy, physiology and embryology, is purely descriptive, and is only to be awarded a higher grade in a scale of studies than that which deals with the external properties, when it requires a better training of the hand and eye to carry it out, and greater patience of investigation. We pass at once to a higher grade of research when we deal with comparisons or processes (which, of course, involve comparisons). All good descriptive work, indeed, is also comparative; but at the best it is so only in the narrowest sense, for only intimately allied forms are compared. In descriptive work we deal with simple facts; in comparative work we deal with their collocation. "Facts," said Agassiz, one day, "Facts are stupid things, until brought in connection with some general law."

It is to this higher plane that concerns itself with general laws that I would urge the young student to bend his steps. The way is hard; but in this lies one of its charms, for labor is its own reward. It is by patient plodding that the goal is reached; every step costs and counts; the ever-broadening field of knowledge exhilarates the spirit and intensifies the ambition; there is no such thing as satiety—study of this sort never palls.

It is hardly necessary to point out that so-called systematic work never reaches this higher grade unless it is monographic; unless it deals in a broad way with the relationship and general affinities of insects. It is not my purpose to call attention here to the needs of science in this department, as they are too patent to escape observation; but if one desires a model upon which to construct such work, one need not look further than the Revision of the Rhynchophora by Drs. LeConte and Horn. Rather than linger here, we prefer to pass directly to some of the obscurer fields of study.

When we compare the number of insect embryologists in America with that of their European colleagues, the result is somewhat disheartening and discreditable; although perhaps the comparison would be not quite so disproportionate were some of our students to publish their notes. But take all that has been done upon both sides of the water, and what a meager showing it makes. Of how many families of Coleoptera alone have we the embryonic history of a single species? Of two of the four families of Butterflies, the fertile eggs of which are perfectly easy to obtain, nothing is known. In short, one may readily choose numbers of typical groups whose embryonic history would be a great acquisition to science.

Here is a broad field. From the special range of my own studies let me recommend to any one eager for this work to choose the eggs of our common copper butterfly, which she will lay to order on sorrel, and the earlier stages of which can be obtained from the parent at two or three different times of the year; or the eggs of any of our common skippers, which deposit on grass, and which are equally easy to obtain, although only once a year. Or, if we turn to Orthoptera, the eggs of our common *Oecanthus*, concealed all winter in raspberry twigs, are more transparent and more easily obtained than those of any other cricket; and our knowledge of the embryology of any of the *Gryllidae* is very fragmentary, and of this particular tribe, *nil*. Better still, perhaps, would be the choice of our common walking-stick, as it belongs to a bizarre and isolated type, now known to be of very ancient ancestry, and of whose embryonic history nothing has been published. I have, indeed, a few incomplete notes upon this insect, but they relate wholly to a late period of development, and were made before the time of the microtome, when work over such coarse-shelled eggs was very difficult and unsatisfactory. The eggs may be readily procured, the insect being abundant in scrub-oak fields; the mother drops the eggs loosely on the ground, and from imprisoned specimens I have procured scores in a single season. Any one who will glance over the history of what has been done in insect embryology will be able to select a hundred examples as important and as easy to obtain as those already named, and by concentrating his work upon them will do better service than in an aimless selection of what may come to his hand.

In following the post-embryonal history of insects there is work for all. While allied forms have in general a very similar development, there are so many which are unexpectedly found to differ from one another, that every addition to our knowledge of the life histories of insects is a gain, and they are to be praised who give their close attention to this matter. Here is a field any entomologist, even the most unskilled, may cultivate to his advantage and with the assurance that every new history he works out is a distinct addition to the science. The importance of an accumulation of facts in this field can hardly be overestimated, and those whose opportunities for field work are good, should especially take this suggestion to heart. Nor, by any means, is the work confined to the mere collection of facts. How to account for this extraordinary diversity of life and habits among insects, and what its meaning may be, is one of the problems of the evolutionist. There are also here some especially curious

inquiries, to which Sir John Lubbock and others have recently called attention, and to which in this country Mr. Riley has contributed by his history of *Epicauta* and other *Meloidæ*. I refer to the questions connected with so-called hypermetamorphosis in insects. In these cases there are changes of form during the larval period greater than exist between larva and pupa, or even between larva and imago, in some insects. There are also slighter changes than these which very many larvæ undergo; indeed, it may safely be asserted that the newly-hatched and the mature larvæ of all external feeders differ from each other in some important features. The differences are really great (when compared to the differences between genera of the same family at a similar time of life) in all lepidopterous larvæ, as well as in all Orthoptera which have come under my notice. No attempt to co-ordinate these differences, or to study their meanings, or to show the nature of their evident relationship to hypermetamorphosis has ever been attempted.

Not less inviting is the boundless region of investigation into the habits of insects and their relation to their environment. The impulse given to these studies by the rise of Darwinism, and the sudden and curious importance they have assumed in later investigations into the origin and kinship of insects, need only to be mentioned to be acknowledged at once by all of you. The variation in coloration and form exhibited by the same insect at different seasons or in different stations, "sports," the phenomena of dimorphism, and that world of differences between the sexes, bearing no direct relation to sexuality; mimicry also, phosphorescence and its relations to life, the odors of insects, the relation of anthophilous insects to the colors and fructification of flowers, the modes of communication between members of communities, the range and action of the senses,* language, commensalism—these are simply a few topics selected quite at random from hundreds which might be suggested, in each of which new observations and comparative studies are urgently demanded.

The fundamental principles of the morphology of insects were laid down by Savigny in some memorable memoirs more than sixty years ago; the contributions of no single author since that time have added so much to our knowledge, notwithstanding the aid that embryology has been able to bring. Nevertheless there remains many unsolved problems in insect

* Notice Meyer's beautiful studies on the perception of sound by the mosquito.

morphology which by their nature are little likely to receive help from this source. Let me mention three :

The first concerns the structure of the organs of flight. The very nomenclature of the veins shows the disgraceful condition of our philosophy of these parts ; the same terminology is not employed in any two of of the larger sub-orders of insects ; names without number have been proposed, rarely however by any author with a view to their applicability to any group outside that which formed his special study ; and a tabular view which should illustrate them all would be a curious sight. A careful study of the main and subordinate veins, their relations to each other, to the different regions of the wing, to the supporting parts of the thorax and to the alar muscles, should be carried through the entire order of insects ; by no means, either, neglecting their development in time, and possibly deriving some assistance in working our homologies by the study of their hypodermic development.

The second concerns the mouth parts. The general homologies of these organs were clearly and accurately enough stated by Savigny, though one may perhaps have a right to consider the last word not yet said when one recalls Saussure's recent claim to have found in *Hemimerus* a second labium. What I refer to, however, is another point : it relates to the appendages of the maxillæ and the labium. Considering the labium as a soldered pair of secondary maxillæ we have at the most, on either pair of maxillæ, three appendages upon either side. These appendages, as you know, are very variously developed in different sub-orders of insects, or even in the same sub-order ; and it has at least not been shown, and I question if it can be done, that the parts bearing similar names in different sub-orders are always homologous organs. Here is a study as broad and perhaps as difficult as the last.

The third is the morphological significance of monstrosities, especially of such as are termed monstrosities by excess. The literature of the subject is very scattered, and the material much more extensive than many of you may think. At present this subject is, so to speak, only one of the curiosities of entomology, but we may be confident that it will one day show important relations to the story of life.

After all the labors of Herold, Treviranus, Lyonet, Dufour, and dozens of other such industrious and illustrious workers, is there anything important remaining to be done in the gross anatomy of insects? some of you would perhaps ask. Let the recent work of some of our own number

answer, which has shown in the Hemiptera and Lepidoptera the existence of a curious pumping arrangement by which nutritious fluids are forced into the stomach. It is certainly strange that after all that has been said as to the mode in which a butterfly feeds, that no one should have dissected a specimen with sufficient care to have seen the pharyngeal sac which Mr. Burgess will soon show us. No! the field is still an open one, as the annual reviews clearly show. The curious results of Floegel's studies of the brain, the oddly-constructed sense-organs found by Graber and Meyer (earlier noticed briefly by Leydig) in the antennæ of Diptera, the important anatomical distinctions discovered by Forel in different groups of ants, the strange modification of the tip of the spiral tongue in *Ophideres*, which Darwin, Britenbach and Künckel have discussed, and, above all, the extensive investigations of the nervous system in insects generally, which Brandt has recently undertaken, the exquisite memoir of Grenacher on the structure of the compound eye, and the keen researches of Graber in various departments of insect anatomy, show, by what has been accomplished, how many harvests are still unreaped. The microtome, too, has put a new instrument of precision into the hands of the investigator in this field.

We might in the same way point out some of the special needs in the study of the finer anatomy or histology of insects, but the pressure of other duties forbids a further pursuit of the subject. Enough surely has been suggested, even in this hasty sketch, to show that we cannot yet rest upon our oars, but must push forward undaunted into still unknown waters. If these few words shall arouse in any one a higher ambition, leading to better work, their aim will have been accomplished.

On motion of the Secretary, B. P. Mann, the minutes of the last meeting of the Club were adopted as printed in the CANADIAN ENTOMOLOGIST.

The President read portions of a letter from Mr. Wm. Saunders, of London, Ont., explaining his absence owing to a severe accident, and expressed the great regret felt by all present that Mr. Saunders was not with them, and that his absence was occasioned by so unfortunate a cause.

The election of officers then took place (by ballot) with the following result:—

PRESIDENT—Dr. John G. Morris, of Baltimore, Maryland.

VICE-PRESIDENT—C. V. Riley, of Washington, D. C.

SECRETARY—B. P. Mann, of Cambridge, Mass.

Mr. A. R. Grote, of Buffalo, N. Y., delivered an able and interesting lecture on certain generic characteristics of the *Noctuidæ*, which, it is to be hoped, he will prepare for publication. At the close of his remarks he expressed his anxiety that describers of Noctuids should refer particularly to those parts on which generic characters are based.

Prof. A. J. Cook, of the State Agricultural College, Lansing, Mich., gave an account of recent investigations in Apiculture. Among many other interesting facts he stated that if the wings of the virgin queen be clipped, or the entrance to the hive be so contracted that she cannot fly forth; or, again, if she be reared where there are no drones, she will not be sterile, but from her eggs only drones will be produced; that the fate of the drones in a hive depends on the prosperity of the colony—with a rapid increase of bees and honey they are safe, but if there is a period of adversity in these respects, unless caused by the loss or sterility of the queen, they are speedily destroyed by the workers; that worker bees are imperfectly developed females; that bees possess and employ the sense of smell, and that they have a good knowledge of locality. In answer to a question from Dr. Morris respecting the alleged robbery of fruit by bees, whether they will not perforate ripe fruits if starved for a time, Prof. Cook replied that he had not tried starvation, but he had placed punctured grapes before bees and found that they would sip the juice with zest, but when he replaced the fruit with sound specimens they did not attempt to touch them.

Mr. Scudder then exhibited some illustrations of rare fossil insects, prepared for publication in Dr. Hayden's report, and a large volume of lithographed plates, colored drawings, &c., of Diurnal Lepidoptera in all their stages, which he had had made to illustrate his proposed great work on the Butterflies of North America.

Mr. J. D. Putnam, of the Davenport Academy, presented some notes on the North American Galeodes (Solpugidæ), and exhibited specimens in illustration.

The Rev. H. C. McCook, of Philadelphia, gave a most interesting lecture on the life history of the Honey Ants of the Garden of the Gods, Colorado, and illustrated it with specimens of the insects and a great number of very large water-color drawings. He described fully the chambers excavated by the ants, the insects themselves in all their forms, their nocturnal habits, and their feeding upon the saccharine juice exuded from the galls of the scrub-oak. He stated that the workers are unde-

veloped females, and that the honey-bearers are a changed form of the worker major with a greatly enlarged crop, in which they store the honey. Mr. McCook has not yet committed his observations to writing, but, we understand, that he will eventually publish them in the proceedings of the Academy of Natural Sciences at Philadelphia. It is impossible to give here even a synopsis of the vast amount of information that he afforded upon this interesting subject.

Prof. Riley remarked, in connection with this subject, that many galls secrete saccharine matter, and that sometimes the gall-insects themselves are entrapped in it; that the ants probably get their honey also from the species of Coccus that frequents the scrub-oaks of Colorado; and that almost all species of ants are able to expand their abdomens when necessary.

Dr. Haldeman observed that the reason why hills were constructed by some ants and not by others was probably because some might have the proper materials conveniently at hand and others not. He urged Entomologists to domesticate ants in order to study their habits, most of which are as yet very imperfectly known.

Mr. Bassett stated that very many species of galls are infested by ants; that he has observed a gall on scrub-oak swarming with ants, and with Cetonia Inda and other honey-loving insects.

Dr. John L. LeConte, of Philadelphia, Pa., read a paper on a collection of Coleoptera obtained from a few hickory twigs. Some hickory trees on a friend's estate, nere Philadelphia, were observed to be diseased and therefore cut down. Some of the twigs were sent to him, and from them he obtained no less than twenty-two species of Coleoptera. He expressed a strong hope that some competent Entomologist should prepare a list of the insects that infest forest trees, and that it should be appended to the report about to be issued by the U. S. Commission on Forestry.

Dr. Morris stated that he also had obtained a considerable number of species of beetles from twigs.

Mr. Haldeman said that the hickory was more infested with insects than any other tree.

Dr. LeConte next read a paper on the so-called "Lightning Bugs" (Lampyridæ):—

Mr. Austin remarked that when a Fire-fly is at rest there is a faint ray of light visible, proceeding from the edge of the segments of the abdomen;

when the insect is emitting the flashes of light it moves these segments and so reveals more of the light.

Mr. Martin stated that he had observed a Fire-fly in a spider's web, and that it emitted very rapid flashes of light at first, but that they gradually diminished in brilliance till at length they died out.

On motion the meeting then adjourned till 8 o'clock p. m.

TUESDAY EVENING SESSION.

At 8 o'clock the Entomological Club met at the Hotel Vendôme, Dr. J. G. Morris in the chair.

Mr. H. F. Bassett, of Waterbury, Conn., gave an account of "the Structure and Development of certain Hymenopterous Galls." He exhibited specimens of galls produced on plants and trees, and spoke of the alternation of two forms belonging to one species. The seminator deposits its eggs in the young acorn, and from the sting or puncture the gall grows, having the appearance of another acorn. This falls to the ground in September, and remains twenty-one months, at the end of which time the gall-flies are produced, which are all females. These females lay their eggs in the buds of the trees in the spring, and from these galls are formed, out of which are developed flies of both sexes. All galls may be divided into two classes:—First, those formed in autumn, which do not develop till the next or a succeeding year, the imagos or perfect insects hatched from them being always females; and secondly, those formed in the spring, the progeny of which are of both sexes. He considered that the woolly substance that covers these galls is an excessive development of the pubescence of the leaf, and thought that the growth of the galls is produced by the action of the poison that is infused by the parent insect when making the sting or puncture, because he often could find in a gall no trace of any larva.

Prof. Riley expressed his opinion that galls are formed both by the poison injected with the egg, and by the irritant action of the larva. He spoke also of the sweet exudation on galls, and remarked that honey-dew is in some cases the natural exudation of the plant independent of the action of insects upon it.

Prof. C. H. Fernald, of Orono, Me., exhibited three volumes recently published by Lord Walsingham on "North American Micro-Lepidoptera, Tortricidæ," illustrated with colored plates, and forming part of the British Museum Catalogues for 1879; also by the same author a volume on the "New and little-known species of North American Tineidæ," and another

on "the Pterophoridæ of California and Oregon." He then proceeded to read a paper on the Classification of Tortricidæ, illustrating his remarks by some wings prepared for the microscope. These slides, which beautifully exhibited the venation of the wings, were mounted with glycerine boiled gently over the lamp; the wings were bleached by Dimmock's process.

Dr. H. A. Hagen, of the Museum of Comparative Zoology, Cambridge, Mass., read a paper on the importation of the Hessian Fly. The generally accepted theory, from which the insect derives its common name, is that the insect was brought from Europe to America about a century ago in the straw used for bedding by the Hessian troops employed by the British Government in the war of the Revolution. This theory Dr. Hagen rejects, and in a sketch of the history of the movement of these troops, he showed that the lapse of time during their transportation was considerably greater than that of the term of the normal development of the fly from the egg. He stated that there was some evidence of the existence of the fly in America before the arrival of the Hessian troops, and that it was unknown in Central Europe till recently; there was, however, some evidence that it may have appeared in certain places on the Mediterranean Coast at an earlier period. He even thought it possible that the fly might have been imported *from* America into the Mediterranean region of Europe by American trading vessels. His conclusions, as stated in a long and very interesting paper, in which he quoted many German and British official records, may be summed up briefly as follows: 1. It is impossible that the fly could have been imported by Hessian troops, as proved by the historical records. 2. The fly must have been in America long before the arrival of the Hessian troops. 3. The fly was not known in Germany before 1857, and is probably an indigenous American insect.

Prof. Riley stated that he had so often noticed a retardation of development in insects, that he should not be surprised if this had been the case with the Hessian fly, when imported. Again, that the "flax-seed state" of this insect lasts so long that it might have crossed the Atlantic during that phase of its existence.

Dr. Hagen replied that Dr. Asa Fitch had already proved the impossibility of this.

Prof. Riley accepted the theory that the fly is indigenous to America, and Dr. Hagen stated that he believed that it is indigenous to both Europe and America.

The meeting then adjourned.

WEDNESDAY AFTERNOON SESSION.

The Club met for an hour at 5 o'clock p. m. in one of the rooms of the Massachusetts Institute of Technology, a large and commodious building which was almost entirely given up to the work of the Association.

The short time at the disposal of the Club was occupied by the continuation of the Rev. H. C. McCook's lecture on the Honey-Ants of the Garden of the Gods, Colorado, the first portion of which he delivered on the previous afternoon. At its conclusion some remarks were made by Prof. Cook and others on birds *versus* insects.

Thursday was devoted by the Association to a visit to Cambridge. Many of the Entomologists took the opportunity of visiting the rooms of the Cambridge Entomological Club, where they were received by Mr. B. P. Mann, the Secretary.

FRIDAY AFTERNOON SESSION.

The Club met in their room in the Institute of Technology at 4 o'clock p. m., Mr. A. R. Grote, Vice-president, in the chair.

Dr. LeConte moved that, owing to a resolution passed at the general session of the Association that morning, the Entomological Club do now organize as a permanent sub-section of the Association; he proceeded to congratulate the Club on the honor thus conferred upon it. It was due to the importance of the subject and the large attendance of Entomologists, no less than to the number of interesting papers offered for their discussion. The resolution was unanimously adopted and the Club at once organized as a Sub-section with the officers elected on the first day of meeting.

Mr. E. Burgess, of Boston, gave an account of the structure of the mouth organs of Butterflies, describing especially and illustrating with diagrams on the black-board, the proboscis, etc., of the Archippus. Remarks were made upon the paper by Dr. Hagen and Messrs. Mann, Cook and Riley.

Dr. Hagen read a paper on the anatomy of *Prodoxus decipiens*, in which he confirmed Mr. Riley's statements.

Prof. Fernald read a paper on *Phoxopteris angulifasciana*, a small Tortrix feeding upon clover.

Mr. O. S. Wescott, of Racine, Wis., gave by request an account of a moth trap for collecting insects by light, which he had employed with much success. Dr. Hoy and Mr. Mann also described insect traps that they had found useful.

Mr. Westcott gave an account of the mode of building its web by a Geometrical Spider, and stated that the insect when forming the concentric lines across the rays measured the distance from the next parallel line by means of its second right fore-leg before attaching the thread to the ray.

Prof. Cook, in answer to a question, stated that he had found a mixture of honey and beer equally efficacious with the ordinary mixture for sugaring.

Mr. Grote remarked that he had found the Colorado Potato Beetle feeding upon a large cultivated variety of Datura, and feared that it would probably soon prove a serious enemy to the Tobacco plant, another member of the family *Solanaceæ*.

Prof. Riley stated that he had found the Colorado Beetle in South Carolina.

The meeting adjourned at 6 o'clock.

MONDAY, AUGUST 30TH.

The Sub-section of Entomology met at the Institute this morning, Dr. J. G. Morris in the chair. For the first time the titles of the papers to be read, with the names of the officers, were published in the Association programme for the day.

Prof. Fernald gave a brief description of his method of preparing and mounting the wings of micro-lepidoptera.

Mr. B. P. Mann gave an account of the contributions of the Cambridge Entomological Club and the progress of Entomology.

Prof. C. V. Riley described the life-habits of certain Bee-flies (Bombyliidæ), and made some remarks on Tree-Crickets and on the early stages of Blepharocera.

Dr. Hagen exhibited a specimen of *Passalus cornutus*, which was entirely destitute of any trace of elytra, but possessed wings and all other parts quite perfect. He stated that it was impossible that the elytra had been artificially removed and that he considered this to be a very rare natural deformity.

Rev. C. J. S. Bethune, in the absence of Dr. Hoy, who was to have read the next paper on the occurrence of *Aletia argillacea* in Wisconsin, stated that he had learned in conversation with Dr. Hoy that this moth had occurred in immense numbers on ripe melons near Racine, Wis., and that he had himself, in the autumn of 1865, taken a great quantity of the

moths feeding on fallen plums and apples, but that ordinarily the moth was not at all common in Ontario.

Prof. Riley considered that the *Aletia* flew to the north when superabundant in its natural home in the cotton growing regions of the South; that it fed there on some malvaceous plant, lived a year, but not probably longer, and then was no longer to be found in northern localities until another emigration took place when it again became numerous. He did not think that it could possibly live for more than a few generations in the Northern States or Canada.

Mr. Mann was of opinion that it must live for years in the North, finding some suitable food plant, though like very many other insects it was frequently scarce and then suddenly appeared in great numbers.

Dr. Lintner stated that he had found the moth at an altitude of 1800 feet on the Adirondack Mountains, and that Dr. Hoy had informed him that he had taken the larva in June at Racine.

Dr. E. L. Mark described some points in the anatomy of the *Coccidæ*.

The list of papers having been exhausted, the Section now adjourned. to meet next year in Cincinnatti, Ohio.

ON LIGHTNING BUGS.

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

Read before the Sub-Section of Entomology, American Association for the Advancement of Science, Boston, Mass., August, 1880.

Since the publication of my synopsis of Lampyridæ in 1851 (Proc. Acad. Nat. Sc. Phila, 1851, 331), but few species of the family have been described in this country, and no very important improvement has been made in their classification; about the same time I published in the Journal of the same Society (New Ser., i., 73) a synopsis of Lycidæ, one of the sub-families of Lampyridæ. This last mentioned synopsis is one of my early and crude contributions to science, which, if the study of Natural History had been farther advanced in this country, would have been kindly suppressed, or returned to me for revision In the Classification of the Coleoptera of N. Am., I have established the family with

different limits to those adopted by European writers at that time (1861), and constituted it of the three following sub-families, which are here more fully defined :

Middle coxæ distant, epipleuræ wanting—LYCIDÆ.

Middle coxæ contiguous, epipleuræ usually wide at base, episterna of metathorax with inner margin sinuate—LAMPYRIDÆ.

Middle coxæ contiguous, epipleuræ narrow at base, episterna of metathorax not sinuate on inner margin—TELEPHORIDÆ.

A detail of the minor groups and tribes composing these families would be here out of place, and may be found in my Classification ; they will be fully exposed in a synopsis of the genera and species now ready for press. Otherwise, the habits and life history of a few species have been more or less thoroughly observed and recorded.

For the past few years I have been trying to procure material to enable me to make a more complete synopsis of the genera and species, and a better exposition of their relations to each other than I had been able previously to give.*

For furnishing series of larvæ, pupæ and imagines of species from her vicinity, I am under especial obligations to Mrs. V. O. King, of Austin, Texas. An excellent account of the transformations of *Pleotomus pallens* from her pen has been printed in Psyche iii., 51 (1880), and equally valuable life-histories of other species may be expected in the future.

I congratulate myself, that by the slow progress of my studies and the tardy manner in which some of my correspondents have replied to my request for larger series of specimens, I am now able to profit by the recent publications of Mr. C. O. Waterhouse† on Lycidæ, and Rev. H. S. Gorham‖ on Lampyridæ.

The object of the present essay is simply to give some popular information in regard to the characters of these insects, and to correlate, so far as our species may permit, the light-giving faculty with other structures ; I will, therefore, not enter here into a close analysis of the relations of the genera.

* I would here mention that no reference is made in the text to the important general work of Lacordaire, or the excellent faunal European work of DuVal, in which the genera have been tabulated in a convenient manner, but without special reference to our species, except what has been derived from my own works cited above.

† Br. Mus. Cat. Illustrations; Coleoptera, Part 1, Lycidæ, 1879.

‖ Trans. Ent. Soc. London, 1880, p. 1, 63, 83, and Proc. loc. cit. infra.

It is then sufficient to say, that none of the Lycidæ or Telephoridæ possess any light-giving organs, and that they are diurnal in their habits. In some of the Lycidæ the front part of the head is prolonged into a beak, and in many of them the elytra are very large, expanded and coarsely reticulated. The peculiar structures of some Telephoridæ will be noticed farther on.

The Lampyridæ proper comprise all the luminous species, though this faculty is possessed by them in a very unequal degree, and in some genera and species of diurnal habits is quite wanting. For our present purposes their division may be indicated into tribes and groups as follows :

A. Side pieces of metathorax narrow ;

a. ♂ and ♀ similar or nearly so ; antennæ long, last joint simple.

b. ♂ and ♀ conspicuously different ; antennæ short, last joint with acicular appendage.

B. Side pieces of metathorax wide (♀ unknown) ; palpi very unequal, mouth organs more developed.

The series A *a* contains the largest number of genera and species, and exhibits a gradation from *Matheteus*, with widely separated pectinate antennæ, and general Lyciform appearance, through *Photinus*, with approximate filiform antennae, and head retracted under the prothorax, to *Photuris*, with the antennae filiform, and the head partly exposed. There is thus a continuous line of affiinities in this series from the diurnal Lycidae to the diurnal Telephoridae.

Now besides the gradations in structure just mentioned there are great differences in the sizes of the eyes, and in the development of the light organs. In the species usually seen flying by day (*Lucidota*, *Ellychnia*, &c) the light organs are indicated by feeble yellowish spots on the last ventral segments, but do not seem to possess any light-giving power ; in these the eyes are lateral, rather small in ♀, but larger and more convex in ♂ ; they are widely separated above and beneath as in Lycidæ.

The series A *b* contains a much smaller number of genera, and in them the antennæ are approximate, usually filiform, rarely (*Pleotomus*) bipectinate. The number of joints varies from 9 to 14, and the last joint has at the end a small acicular appendage simulating an additional joint. The eyes of the ♂ are excessively large, almost contiguous above and beneath, leaving very little room for the mouth and antennæ ; in the ♀ the eyes are moderate, or even small, lateral and widely separated. The

light organs are varied, sometimes brilliant in both sexes, sometimes weak in both sexes, and sometimes brilliant only in the ♀. Their food consists of small terrestrial mollusca.

The third category, B, consists of *Phengodes* and allied genera in which the side pieces of the metathorax are wide. I know nothing by observation of the luminous qualities of these insects, of which only males are known. They are all rare, and I have seen none alive. But we here owe our special thanks to Mrs. King for the patient quest which has been rewarded by the discovery of the pupa of *Phengodes*, and which will probably result in another season in the detection of the larva.*

I am also indebted to Mrs. King for a larva of *Mastinocerus*, of slender, cylindrical form and pale color. It was feebly luminous, and lived upon small snails. The perfect insect is thus mentioned in a letter, the observations being made upon a specimen attracted by the lamp: "June 4th saw running rapidly over the table near a lighted lamp, a small Coleopter; it was twisting its abdomen up over its wings, and evidently trying to straighten them out, as they seemed moist and twisted at their ends. The general appearance suggested *Mastinocerus*, and acting on this thought, I captured it and sat up till a late hour to be assured of the truth. The insect was in a small vial, and moved quickly. It gave out light conspicuously from the head, feebly from the anal end, and still more so from about the base of the abdomen. The light seen in the head, though visible in the dark as a round spot, yet when taken into a room obscurely lighted was invisible from above; but when the insect was suddenly thrown upon its back a light no larger than a pin point was seen just about the junction of the head and prothorax." . . .

It is quite possible that the genera of the other continent constituting the sub-family Drilidae should be placed as a group of this series; but upon this point I cannot speak with confidence, as I have had no opportunity of studying them carefully. They live on snails, and some of them pass through their transformations in the shells of the animals upon which they have fed.

* It is still uncertain whether the large luminous larvæ described by Baron Osten Sacken (Proc. Ent. Soc. Phila., i., 125, pl. 1, f. 8) belong to the Elateride *Melanactes* or to *Phengodes*. Species of both genera are found in nearly all parts of the United States, but though the larvæ seem to resemble that of *Mastinocerus* referred to in the text more than any described Elateride larvæ, it is more probable that they should be referred to the latter family.

As regards the third sub-family, Telephoridae, it is merely necessary to mention that the eyes, without being excessively large in either sex, are invariably larger in the ♂ than in the ♀, and that in the lower forms (*Malthodes*, &c.) there is an extreme complication in the development of the last abdominal segments.

We have, then, in Lycidae a tendency, with simple sexual characters, to elongation of the anterior part of the head. In the Lampyridae the sexual characters are diffused over the whole body, but with no tendency to elongation of the head or complication of the posterior abdominal segments; and in addition there is a peculiar apparatus for the emission of light, which although absent in some genera, does not exist at all in the other two sub-families.

Finally, in Telephoridae there is a slight reminiscence of the anterior extension of the head in certain species of *Podabrus*, which have a broad muzzle. In general the mouth organs are more powerful than in the other sub-families. The sexual characters are of an ordinary kind, but in *Chauliognathus* and *Malthodes* the last abdominal segments of the ♂ are largely developed. In some species of the last named genus the complication of these rings resembles nothing that I know in nature, except the curious structures of Tipulidae figured by Osten Sacken.* In *Ichthyurus*, an Asiatic genus, the middle legs of the ♂ are singularly inflated; and in *Silis* there are curious processes near the hind angles of the prothorax; a very deep fissure limited on each side by a prolongation, and complicated by a moveable articulated process attached to the inflexed flank of the prothorax. In several species this articulated process terminates in a long bent filament, and the apparatus probably serves like a somewhat similar one on the first antennal joint of the ♂ of the Malachide *Collops*, to clasp the antennæ of the ♀.

After this statement, which is as brief as I can make it, of the arrangement into sub-families and tribes of the Lampyridæ, with the principal modifications of structure in each, we are prepared to consider the variations in the light organs, and their sexual correlation with the eyes and wings in the Lampyridæ proper.

We have seen that the greatest development of the eyes takes place in the male of the series A *b*, or Lampyrini, in which the antennæ are very short in both sexes. The female is without wings, and has the eyes

* Proc. Acad. Nat. Sc. Phila., 1859, 197, pl. 3 and 4.

moderate (*Phausis*), or very small (*Microphotus*). The light organs are either brilliant in both sexes (*Phausis reticulata*), wanting in the male (*P. inaccensa*, female unknown), feeble in male and brilliant in female (*Pleotomus*, and probably *Microphotus*). In the Photini the light organs are completely wanting (*Tenaspis*, n. g.), obsolete and ineffective (*Lucidota*, *Ellychnia* most species); well developed in both sexes, but more brilliant in male than female (*Pyractomena*, *Photinus*); equally brilliant in both sexes (*Photuris*): in all these the antennæ are long, either slender or broad, and closely approximate; the eyes are widely separated on the upper side, and usually also beneath. In *Matheteus* and *Polyclasis* the antennæ are pectinate, or bipectinate, and rather widely separated; the eyes are more distant, and the light organs wanting.

The Phengodini are known only by the male. The eyes are lateral, convex, moderate in size, and widely separated; the antennæ are distant at their insertion, plumose in *Phengodes* and *Zarhipis* (n. g.); bipectinate in *Mastinocerus* and *Cenophengus* (n. g.); pectinate in *Pterotus*, and serrate in *Tytthonyx*, if I am correct in associating that genus with this tribe. *Phengodes* is said by Lacordaire* to be luminous, while the observations of Mrs. King above cited prove that *Mastinocerus* is also phosphorescent.

From this detailed statement it may be inferred that there is no distinct correlation between the eyes, the antennae, and the light organs of the two sexes which obtains for the whole sub-family.

That the eyes of the male should in comparison with the other organs of special sense, the antennae, be more largely developed than in the female, is explicable from the more generally active disposition of that sex, but that these characters should prevail in the contradictory categories, where the female is more brilliant, and where she is less brilliant than the male, does not seem to me explicable either on grounds of teleology or natural selection, and especially do these explanations seem imperfect when we consider that the largest eyes are possessed by those males which seek the most brilliant, but also the most helpless females.

The luminous powers of these insects suggest three distinct investigations, which seem to me very important, and to which I would earnestly invite the attention of my colleagues in other branches of science:

1st. Spectroscopic examination of the nature of the light, and an

* Gen. Col., iv., 345.

analysis of the elements concerned in producing such brilliance at low temperatures.*

2nd. Biological observation of the particular arrangement of cells, which enables such an amount of light of a high grade to be produced by the metamorphosis of ordinary tissues, without the heat of incandescence.†

3rd. Chemical analysis to determine the nature of the proximate principles which are thus oxidized in the production of light without heat.‡

None of these researches can be conveniently made in the Northern States, but in the Middle and Southern States, and especially in tropical America, they can be readily entered into, and none of them fall properly within the sphere of investigation of Entomologists.

It is unnecessary for me to expand on the scientific value of the investigations here proposed. Luminosity of a much lower grade than that exhibited by these insects has been generally ascribed by physicists to matter at very high temperatures, even in the cases of Auroræ and Nebulae; and in fact the experiments of Mr. Crookes upon radiant matter under the influence of electrical currents would tend to confirm such a supposition.

Should, however, the investigations I have suggested justify the belief, as seems probable, that large evolution of highly-refrangible light may take place without high temperature, our cosmical theories may need to be partially modified. And should the chemist ascertain with accuracy what precise combination of molecules of the ordinary constituents of

* Some slight efforts have been made in this line of investigation, but nothing satisfactory has been published. Mr. Meldola (Proc. Ent. Soc. London, 1880, p. iii), observes: "that the exact nature of the phosphorescence was still an unsolved problem both to the physicist and biologist. Some years ago he had examined the spectrum of the glow-worm, and found that it was continuous, being rich in blue and green rays, and comparatively poor in red and yellow."

† In regard to the structure of the light-giving organs, I have found only some superficial notices by authors whom it is scarcely necessary to cite on the present occasion. It is narrated that they are rich in fat cells, and abundantly supplied with nerves and air-tubes; the histological observations of Schultze do not show the manner in which the light is produced.

‡ As to the composition of the fats contained in these special organs, I believe that no investigation has been made, though in this instance, as in the cases of the acid secretion of *Harpalus*, the liquid explosively emitted by *Brachinus*, and the singular excretion of *Chlaenius*, which combines the odor of camphor and kreasote, the materials are easily procured, and the results would be physiologically important.

organic bodies will thus by slow oxidation give such a disproportionate amount of light, we may enter upon a path which leads to the accomplishment of one of the great desires of civilization, the production of light, without undue expenditure of energy in the development of heat, as a waste product.

In regard to the manner in which the light is evolved, I have but little information to give, though what I say may serve to correct some erroneous views which have been elsewhere expressed.

The popular name of these insects, *lightening* (or lightning) *bugs*, as distinguished from *fire flies*,* is derived from the fact that the light is intermittent. It is never entirely extinguished, but is paroxysmally weak and brilliant. When seized, under the influence of fear, the intervals become irregular, and the flashes are frequent. When put into alcohol there is at first a fitful and rapid exhibition of light, but afterwards the light becomes moderate and permanent for some minutes. When the light organs are separated and crushed, the light also continues for some time, becoming gradually weaker.

I therefore infer that the excitement of the light-giving organs to the highest degree of activity is manifested by the supreme effort of the will of the animal, and that the exhibition of light is dependent upon a particular structure, more or less under the control of the will, but containing a special material capable of evolving the light independent of the will. In a similar way to that in which the voluntary muscles of all animals evolve motion, and the special electrical organs of certain fishes evolve electrical currents, so do these organs of the Lampyridae evolve light from some peculiarly constituted structure fitted for the purpose.

It may be conceded, after what has been said above, that the idea of Mr. Gorham,† that "the external white vitreous parts are diaphanous, and permit the light to shine through," is perfectly correct, but that his belief that "the source of light within the body of the insect can be pressed against these windows, or retired from them at its pleasure," is quite without foundation.

* Fire flies are Elateridæ of the genus *Pyrophorus* (Spanish *Cucuyo*), of which one of the smaller species, *P. physoderus*, occurs in Florida and Texas, and shine with a constant light, chiefly visible in two vesicles near the hind angles of the prothorax, which are convex, and covered with a transparent chitinous integument. All species of *Pyrophorus* are not phosphorescent.

† Trans. Ent. Soc. London, 1880, p. 66.

Several authors have remarked upon the tendency of the winged Lampyridae, in countries where large numbers of the same species are in view at one time, to exhibit their light at rhythmic intervals. I have never observed this in the United States, nor in those parts of tropical America which I have visited. I think that, in this respect, there must be great differences in the habits of the species. In travelling by night on railroads in the Middle States, I have frequently seen in low and moist lands near the road many thousands of these insects (chiefly *Photuris pensylvanica*), which sparkled and twinkled to such an extent that one might imagine himself on the Glittering Heath* itself, on which the hero of the great epic of our race achieved his first victory, and gained his double prize. But I have never seen any approach to a rhythmic effect in these sparklings, as described in the books.

The causes to which this singular phenomenon are ascribed are either physical or physiological.† In order that my readers may give these

* But lo ! at the last a glimmer, and a light from the West there came,
And another and another, like points of far off flame ;
And they grew and brightened and gathered, and whiles together they ran
Like the moon-wake over the waters, and whiles they were scant and wan.
—Sigurd the Volsung, Book II, p. 137.

† Proc. Ent. Soc. London, 1880, p. ii., Mr. McLachlan . . "had at that time advanced the opinion that the phenomenon in question might be caused by currents of air inducing the insects to simultaneously change their direction of flight." Sir Sidney Saunders: "The simultaneous character of these corruscations among vast swarms would seem to depend upon an intuitive impulse to emit their light at certain intervals as a protective influence, which intervals became assimilated to each other by imitative emulation."

Ibid, p. vii. : "Mr. McLachlan, in connection with his idea of the supposed contemporaneous flashing of all the individuals in a swarm of Lampyridæ, called attention to flies of the genus *Argyra*, which when flying exhibited at times an appearance similar to that of small snow-flakes, owing to the silvery pubescence with which part of the body was clothed, but which was observed in certain positions, and especially when the insects rested, owing to the pubescence being then concealed ; he thought this to some extent was an analagous case to that of the light of swarms of Lampyridæ." Sir Sidney Saunders observed : . . . "as to the contemporaneous flashes of myriads, such as are more frequently congregated on the calmest nights, surrounding objects previously involved in obscurity, become suddenly illuminated as if by electricity, and as rapidly plunged into their antecedent gloom at alternate intervals. He could not concur in the hypothesis that currents of air had any connection with such displays or exhibitions, when not a breath was stirring around ; nor that these manifestations might be evoked

views due weight, I have cited them at some length in the foot note. My own impression is that Mr. Belt and Sir Sidney Saunders have given, between them, the true explanation of the rhythmic exhibition of light, and that apart from the aesthetic realization in nature of this plan of making night glorious by the wonderful brilliancy of such insignificant objects (upon which idea this is neither the time nor the place to discourse), it is primarily a defence of the insects against danger, and is secondarily caused by that tendency to act in concert or imitation which operates upon all sentient beings. This tendency may be equally observed in a flock of sheep following its leader, a school room of hysterical girls, a political meeting, a spiritistic séance, or a hyper-sentimental religious assemblage. And I regard all these occurrences, however differing in the importance of their final results, as individual instances in a large class of similar phenomena, caused by aggregated sympathy.

I would therefore agree with Sir Sidney Saunders and Mr. Meldola in quite rejecting Mr. McLachlan's view that it is produced by a change in position of the insects caused by currents of air, or even voluntary movements in direction of flight.

To recur to the process by which the light is produced, I would add to what I have said in the beginning of this essay, that the chemical processes possible in the bodies of Lampyridae can be scarcely if at all different from those which take place in neighboring and closely allied tribes. We may therefore infer from the observations of Mr. Meldola that the ordinary metamorphoses of tissues, by the aid of some slight modification of composition and cellular structure, are capable of evolving light, which belongs to the upper end of the spectrum, such as is generally significant of the highest temperatures.

It is therefore the more extraordinary to find in these insects light of a high order not dependent on elevation of temperature, and consequent

by sexual influences, amid vast hosts instigated to combine therein, and act in unison. He would rather attribute this phenomenon to an inherent tendency to emit their light from time to time, requiring a certain amount of repose to recruit their powers; and when any thus surcharged felt intuitively inspired to take the initiative, the others—prompted to obey a corresponding influence—followed such suggestion in responsive sequence." Ibid, p. viii.—"Mr. Meldola stated that Mr. Thomas Belt (Naturalist in Nicaragua, p. 320) had expressed his belief that the luminosity of the Lampyridæ played the same part as the bright colors of many caterpillars, *i. e.*, that it served as a danger signal, warning nocturnal foes of the inedibility of the species of this family, which he had found to be generally distasteful to birds, &c."

waste of energy in heat. For it must be observed, that while in one sense heat is the cause of all the phenomena we perceive, since they all have existence only within certain ranges of temperature, in another sense heat is frequently a waste product, and the only one by which the dissemination of energy occurs so as to become imperceptible.

I am aware that the sketch I have here given of the present condition of our knowledge of Lampyridae has been written to the demonstration of my own ignorance (and that of all other students) in regard to some of the most important questions involved. But if I succeed in causing you to look upon these remarkable insects with more interest than you have previously felt, neither my time in preparing, nor your time in listening to this essay, will have been wasted.

I would especially invite the attention of the younger observers in entomology, who have to pass through the labor of patient field work and close observation of habits, before they can ascend with profit to the higher retirement of the museum and the library, to contribute more fully to our knowledge of the development and habits of the different species.

I would equally ask the attention of my colleagues, who by long training in refined experimental research are qualified for such investigations, to the solution of the physical and chemical problems suggested by the singular production of high light without heat by these animals, which are within such easy reach. And by the solution of these problems I am convinced that our knowledge of molecular physics will be increased, and our powers of theorizing less fettered by conventional ideas.

ON THE SYNONYMY OF NORTH AMERICAN NOCTUIDÆ.

BY A. R. GROTE.

I have recently been favored by Mr. Tepper and Mr. Graef with the sight of some of Mr. Morrison's types of Noctuidæ. A few of the specimens are in poor condition, too poor, I think, to have allowed them to serve as types. Others are in good order, and those I have here noted are quite easily recognizable. It will be thought extraordinary, from the determinations, that Mr. Morrison should have allowed himself to criticize

any one for overlooking structural features in this group, or for re-describing species. I am of opinion that the short descriptions of Agrotids published by Mr. Morrison in Bost. Proc., Dec., 1874, are too brief and misleading to be cited. The species are hastily compared with others to which they are not closely related, as *saxigena* with *sigmoides*, whereas *saxigena* is, in my opinion, the same as *imperita* Hubn., from Labrador, a very different species. In every case, as far as I know the species, these comparisons are wide of the mark and consequently deceptive, and since the other characters given are very short, it renders the identification of the species intended improbable, if not impossible. It is necessary to observe the structure of the front, eyes, and the armature of the legs, in order to present intelligible descriptions in the Noctuidæ. In addition to his frequent failure to do this, Mr. Morrison uses such terms for color as "gray" and "yellow" in a manner which, to me at least, is misleading. There is an air of exactness about Mr. Morrison's definitions which I do not find justified on examining his types.

Schinia media Morr., Proc. Bost. S. N. H., 123, 1875.

Under this name Mr. Morrison has re-described *Plagiomimicus pityochromus* Grote, Bull. B. S. N. S., I., 182, 1873. The genus differs from *Schinia* by the frontal structure and very decidedly; *Polenta* Morr. is a closely allied form, and probably the genera are not sufficiently distinct. The markings of the two species *pityochromus* and *Tepperi*, show much the same pattern.

Ceramica rubefacta Morrison.

Under this name Mr. Morrison has re-described *Mamestra vindemialis* Guen. and Grote. *Mamestra congermana*, described by Mr. Morrison as a Hadena, but which has hairy eyes, is allied to *vindemialis*.

Luceria loculata Morr., Bull. B. S. N. S., II., 110, 1874.

Under this name Mr. Morrison has re-described *Hadena passer* Guen.

Agrotis perquiritata.

Polia perquiritata Morr., Proc. Bost. Soc. N. H., 136, 1874.

Mr. Morrison's description of this species, which has the tibiae armed

and resembles the European *Agrotis speciosa*, as a *Polia*, a genus in which the tibiae are unarmed, must be my apology for having recently re-described the species as *Agrotis Baileyana* in the pages of the North Am. Entomologist.

Mamestra thecata Morr., Proc. Ac. N. S., Phil., 59, 1875.

This is *Graphiphora (Taeniocampa) contrahens* Walk., sp. as determined in the D'Urban collection. Where Walker described it is not known to me at this time. It is not a *Mamestra*, but a *Graphiphora*.

Mamestra curta Morr., Ann. N. Y. Lyc. N. H., 96, 1875.

Orthosia perpura Morr., Proc. Ac. N. S., Phil., 66, 1875.

These two are identical, the habitat of *perpura* being erroneous. The species is *Anarta nivaria*, thus twice described by Mr. Morrison, once under *Mamestra*, in which genus the eyes are hairy, and once under *Orthosia*, in which they are naked.

Hadena norma Morr., Can. Ent., 7, 216.

Lithacodia penita Morr., Proc. Ac. N. S., Phil., 71, 1875.

This is *Eustrotia mariae* Grote, a frail species, varying much in size. It is certainly not a *Hadena* or a *Lithacodia*, but belongs, I believe, to *Eustrotia (Erastria)*. *Penita* is a dark specimen, but evidently the same thing. Mr. Morrison's generic references are confusing.

Actinotia deriupta Morr., Proc. Ac. N. S., Phil., 62, 1875.

This is *Prodenia phytolaccae* A. & S.

Orthosia differta Morr., Proc. Ac. N. S., Phil., 67, 1875.

This is a re-description of *Pyrrhia illiterata* Grote, Proc. Ac. N. S., Phil., 211, 1874. I think *aurantiago* Guen., not very fully described, is an older name for this species.

Polia aspera.

Acronycta aspera Morr., Proc. B. S. N. H., 132, 1874.

Polia diffusilis Harvey, Can. Ent., 10, 56.

Mr. Morrison compares his species with *Acronycta subochrea*, than which nothing could be more misleading, and sufficiently excuses the re-description of the species. The type is a female in poor condition, and

undoubtedly belongs to Dr. Harvey's species, which by its gray color recalls the species of *Apatela* or *Acronycta*.

Caradrina meralis Morr., Can. Ent., 7, 215.

I have, unfortunately, re-described this species as *C. bilunata*, Can. Ent., 9, 199.

Tarache obatra Morr., Proc. Bost. S. N. H., 124, 1875.

This is evidently a species of *Spragucia* allied to *Spragueia plumbifimbriata;* it would be quite impossible to recognize the fact from the description and comparisons of Mr. Morrison.

Agrotis personata Morr., Proc. Bost. Soc. N. H., 238, 1876.

This is a dark specimen of *Agrotis pitychrous* previously described by me.

Agrotis manifestolabes Morr., Proc. Bost. Soc. N. H., 166, 1874.

This is a synonym of *Agrotis (Matuta) Catherina*, Grote, Can. Ent., 116, 1874. I have evidently been in error in considering my type a male and also in proposing a new genus for its reception. The male antennae are pectinate. The female type is photographed Can. Ent., vol. 7. It passed from my hands immediately after description, which prevented my making any comparison or re-examination. Since then I have seen the ♀ *manifestolabes* in Mr. Tepper's collection, and it is evidently my *Catherina*.

Taeniocampa confluens Morr., Proc. Bost. S. N. H., 159, 1874.

Mr. Morrison's type is a little smaller, but color and markings are much like ordinary specimens of the common *incerta*. The stigmata run together, but they approach very closely and sometimes touch in *incerta;* there is nothing like such a fusion of the spots as we see in *normalis* in Mr. Morrison's type, and I think the specimen cannot be distinct from *incerta*. Certainly there should have been some hesitation in naming the species in view of the known variability of *incerta*, with which Mr. Morrison does not compare it or appear aware of its close relationship, if not identity. *T. pacifica* Harvey has been collected in Texas by Belfrage, and is, I think, distinct from *incerta*.

On page 58, of vol. 7, of the CANADIAN ENTOMOLOGIST, I gave a list of Mr. Morrison's synonyms in the Noctuidae then known to me. I have since then become acquainted with more of Mr. Morrison's species, many of which appear to me undoubtedly valid and well described. Difficulties were thrown in my way in my endeavor to find out what Mr. Morrison's descriptions covered. There still remain a considerable number of Mr. Morrison's species which I cannot identify and would like to know, to enable me to place them in a new List of our Noctuidae upon which I am at work. The following is the list of synonyms I have made out:

Hadena ancocisconensis Morr. - *Hyppa xylinoides* Guen.
Hadena norma Morr. = *Lithacodia penita* Morr.
Luceria loculata Morr. = *Hadena passer* Guen.
Ceramica rubefacta Morr. = *Mamestra vindemialis* Guen.
Mamestra thecata Morr. = *Graphiphora contrahens* Walk.
Orthosia perpura Morr. = *Mamestra curta* Morr.
Panthea leucomelana Morr. = *Audela acronyctoides* Walk.
Mamestra illabefacta Morr. *Mamestra lilacina* Harvey.
Actinotia derupta Morr. = *Prodenia phytolaccae* A. & S.
Orthosia differta Morr. = *Orthosia aurantiago* Guen.
Orthosia baliola Morr. = *Gortyna purpuripennis* Grote.
Copipanolis vernalis Morr. = *Eutolype Rolandi* Grote.
Xanthoptera nigrocaput Morr. = *Exyra Ridingsii* Riley.
Schinia media Morr. - *Plagiomimicus pityochromus* Grote.
Schinia var. *oleagina* Morr. = *Schinia gracilenta* Hubn.
Mamestra rufula Morr. = *Mamestra lubens* Grote.
Acronycta pudorata Morr. = *Acronycta grisea* Barns.
Agrotis manifestolabes Morr. *Agrotis Catherina* Grote.
Agrotis perpura Morr. = *Agrotis euroides* Grote.
Agrotis personata Morr. = *Agrotis pityochrous* Grote.
Agrotis opipara Morr. = *Agrotis islandica* Staud.
Agrotis scropulana Morr. = *Agrotis carnea* Thunb.
Mamestra teligera Morr. = *Mamestra vicina* Grote.
Chariclea pretiosa Morr. - *Cirrhophanus triangulifer* Grote.
Telesilla vesca Morr. = *Galgula subpartita* Guen.
Taeniocampa confluens Morr. *Graphiphora incerta* Hubn.
Agrotis saxigena Morr. = *Agrotis imperita* Hubn.