

There is little need of comment upon Fischer's classification of scales of coleoptera into conchiform scales (Muschelschuppen), metallic scales (Metalblattschuppen), granulated scales (Granulationsschuppen), piliferous and shaggy scales (Haar- und Zottenschuppen) and fibrous scales (Faserschuppen). Leydig, as quoted above, destroyed the value of the division of granulated scales, and I have found that the division of fibrous scales owes its origin to what Fischer would call "granulations," that is to air-spaces, only that, in this case the granulations are arranged longitudinally in stripes. I can present no new classification of scales, if such a classification is possible, without studying more forms.

Before concluding this paper I will add a note on the mode which I have employed to gather scales, and some other minute objects of like nature, together upon one place on a microscope

slide. The process consists in putting the scales in a drop of some quickly evaporating substance—chloroform is best for most purposes—on the slides. The scales will form in a kind of whirlpool, nearly all the scales finally settling down, as the liquid evaporates, in one place on the slide. Rapping the slide gently sometimes aids in the collecting together of the scales, and the tip of the scalpel used to scrape the scales from the insect can be washed in the drop of chloroform, thus saving every scale when they are from a rare specimen from which one desires to remove only a few scales. By inclining the slide gently, the mass of floating scales can be made to settle on the exact centre of the glass. One part of Canada balsam added to several hundred parts of chloroform will cause the scales to stick firmly to the slide.

(To be continued by a notice of some literature seen since preparing the original paper.)

## THE CLASSIFICATION OF THE TINEIDAE.

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My attention has just been called to an article by Mr. Grote in *Papilio*, vol. 3. On page 43 he writes "I do not wish to enter into an argument as to the best classification of the *tineidae*, but disagreeing with Mr. Chambers, I do not think any one would take *Anaphora* for any thing but a tineid;" and on page 38 he writes, "So far as I have studied them we appear to be able to classify our moths under *sphingidae*—*tineidae*", &c., &c., naming the families usually adopted. I refer to this subject because the first of these above-quoted passages

conveys the impression that I have stated that *Anaphora* ought to be placed elsewhere than in *tineidae*, and because the second quotation gives me an opportunity to write more fully than I have elsewhere done as to the classification of the *tineidae*; an opportunity that I desire because two such distinguished entomologists as Lord Walsingham and Mr. Grote have, very courteously of course, taken me to task for the expression of opinions as to the classification of the *tineidae* which are by them considered more or less

heterodox. I am not aware that I have anywhere expressed such an opinion as is by implication at least attributed to me in the above quotation as to the position of *Anaphora*. Mr. Grote was, I suppose, thinking of some remarks by me in an article in a previous number of *Papilio*, which was written in response to one by Lord Walsingham. His Lordship had stated that "It is surely easier at first sight to separate these [tineid] genera from those of other families" &c., than to locate or separate certain other genera of those other families, thus seeming to convey the idea that there is a something, *je ne sais quoi*, about the tineid genera referred to by him which made it comparatively easy, "at first sight," to refer them to the *tineidae*; and if Mr. Grote will look at my paper in *Papilio*, a little more carefully he will see that my remarks upon *Anaphora* hinge upon the words of Lord Walsingham, "at first sight;" and that while I do not deny the tineid affinities of *Anaphora* I was unable to see with Lord Walsingham this indefinable and to me inappreciable something which makes the location of the tineid genera among the *tineidae* easy "at first sight" as compared with the genera of other families mentioned by his Lordship; and I instanced *Anaphora* as a tineid genus which at first sight—by one who was unacquainted with it—was more likely to be referred to the *noctuidae* than to the *tineidae*. And I am yet of that opinion. There is something in the size, form, and color, especially of the darker species of *Anaphora*, that "at

first sight" is much more suggestive of the *noctuidae* than it is even of the true *tineidae*, to which examination shows that it belongs: and if there is anything about *Anaphora* that "at first sight," or "second sight" either, shows it to belong to any other section of *tineidae* than that which contains *Tinea* proper, I don't know what it is. If there is anything under the sun about *Anaphora*, or for that matter about a true *Tinea*, say *T. tapetzella*, which at first sight, or upon the most careful examination, suggests that it is more closely allied to *Gracilaria*, *Lithocolletis*, *Gelechia*, *Cemiosstoma*, or any of the host of smaller *tineidae* than it is to *Noctua*, I have failed to detect it, and if no resource was left to me but to either place *Anaphora* in *noctuidae*, or in the same family with *Phyllocnistis* or any of the genera of smaller moths known to me, then I should unhesitatingly refer *Anaphora* to the *noctuidae*. *Anaphora* no doubt belongs to the *tineidae*, restricted to the allies of *Tinea* by Mr. Stainton in his *Insecta Britannica*, v. 3, but neither Lord Walsingham nor Mr. Grote uses the name *tineidae* in this sense in the papers above quoted. Both, in the papers in *Papilio* above mentioned, have discarded even Stephens' distinction between *tineidae* and *hyponomeutidae*, and include under the name *tineidae* all or nearly all of the genera included by Stephens in both of his families, with some others not mentioned by him, thus placing *Cemiosstoma*, *Nepticula*, *Tischeria*, *Phyllocnistis*, *Aspidisca*, *Heliodines*, *Lithocolletis*, *Gracilaria*,

*Gelechia*, and a host of other genera, so numerous that time fails me to mention them, possessing among themselves the most varied structure and metamorphoses, along-side of *Anaphora*, *Tinea*, *Exapate*, *Ochsenheimeria*, &c., as genera of equal value in the same family, the *tineidae*!

Lord Walsingham does indeed, in *Papilio*, refer to certain sub-groups of the family *tineidae*, but still he evidently considers them minor groups and looks upon the *tineidae* as a homogeneous group or family in the same sense with *noctuidae* or *geometridae*. To my view it (the *tineidae* of these authors) is about as heterogeneous a group of moths as that would be which should contain the *bombycidae*, *noctuidae*, *geometridae*, *tortricidae* and *pyralidae* thrown into one: the species or genera comprised in it have no unity of structure, habit, metamorphosis, life-history, habitat, or ornamentation, and a family which comprises the genera referred to above (and others equally heterogeneous) might just as consistently contain all lepidoptera heterocera at once: it would then scarcely be more mixed than it is now. I don't like to dissent from such able and distinguished entomologists as Lord Walsingham and Mr. Grote, but truth is better even than good company.

I have stated elsewhere that I thought Stephens' classification of the *tineidae* thoroughly vicious. This language is too strong. I will say rather that I think his classification radically bad in so much as it gives too much weight to the presence of both pairs of palpi, and their size — it is too much a palpal classification — not consistently carried out, and one which it seems to me im-

possible to carry out consistently. Still it was a step in the right direction, and infinitely better than the arrangement which places all of the genera known to Stephens and many others in a single family. The objection to Stephens' arrangement is that it does not recognise families enough, and my objection to Mr. Stainton's classification is that it recognises perhaps too many. Mr. Stainton's *tineidae* (restricted) seems to be a good and natural family of equal or nearly equal value with the *noctuidae*, but his *gracilaridae* and *lithocolletidae*, together with *Phyllocnistis*, instead of forming two families and part of a third, form together a single, well defined family. The structure and metamorphoses of the larvae and pupae seem to me to separate these moths from all of the known *tineidae*, and to unite them in a single natural group having family characters more than usually well marked. Whether the structure of their larvae and pupae are the result of evolution from some lower form, or of degradation from some higher one, that evolution or degradation has evidently been along the same lines in all of the genera included in the group, and shows a near relationship between them as well as a different development from anything that is known elsewhere among lepidoptera: for the course of development from the egg to the imago is different entirely from that of all the other groups of the order, and the eggs themselves are of different shape, size and consistency from those of all the other small moths known to me. They form, therefore, in my opinion, a family at least as dis-

tinct and well limited as the true *tineidae* or even more so. The *nepticulidae* seem to me to form another natural family. The immense host comprised in Mr. Stainton's families *hyponomeutidae*, *gelechidae*, *glyphipterygidae*, *coleophoridae*, form at least one other family, if not more than one, though I incline to include the last three, at all events, in a single family. A large number of genera of his family *elachistidae* may probably be included in the *gelechidae*, but there will still remain many of the others which are difficult of location, unless each of them shall itself be held of family rather than of generic value. Thus *Tischeria* seems to me especially to stand alone. Mr. Stainton places it in *elachistidae*; Dr. Clemens thought it belonged in *lithocolletidae*, an opinion in which I also was at one time inclined to concur, when looking only to some of the characters of the imago: but those of both larva and imago separate it *toto coelo* from *lithocolletidae*, and those of the larva separate it from all other lepidoptera: its labrum and maxillae are as much like those of some coleoptera. *Cemiostoma* also is *sui generis* or rather *sui familiae*. Mr. Grote rightly attaches much importance to the neuration of the wings, but, judged by this test, *Cemiostoma* seems to me to stand, if not alone, at least in no close relationship to any other genus. Our American species, *C. albella*, even differs from the European *C. laburnella*, as figured by Mr. Stainton in *Insecta Britannica*, v. 3, in that *albella* has the median vein of the primaries furcate at the base, as well as in other minor respects. The pupae are in some respects singular,

and in the larva the structure of the trophi is as distinct and unique as it is in *Tischeria*. Mr. Stainton places *Cemiostoma* in his family *lyonetidae*, along with *Bucculatrix* (the affinities of which are rather with *Nepticula*) and *Phyllocnistis* (which I think belongs with *Coriscium* and *Lithocolletis*). In the same family he places *Lyonetia* and *Opostega*, the affinities of which are yet doubtful, the latter probably belonging near *Phyllocnistis*. It seems to me that this family (*lyonetidae*) cannot stand; and there still remain, especially among the lower genera of *elachistidae*, many forms as to the proper location of which I am not able to form an opinion. But with what sort of consistency and upon what scientific principles all of these multitudes of such diverse structure, metamorphosis, life-history, habitat, form and ornamentation, can be thrown into a single group, the equivalent of a single family of the higher heterocera, I cannot comprehend; but it seems to me—with the greatest deference for such authorities as Lord Walsingham and Mr. Grote—that in all of the particulars just enumerated, the insects associated by them under the common family name *tineidae* present family characters in variety as great as or even greater than all other heterocera combined.

Like Mr. Grote I do not desire any controversy on this subject, and have written above all that I desire to say or shall say upon it, and here take my farewell of it, hoping that nothing I have written will be considered to be in the least degree wanting in respect to either of the distinguished gentlemen above-named.

