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## CENTRAL AMERICAN ENTOMOLOGY

*Biologia Centrali-Americana. Insecta: Coleoptera.* Vol.

III. Part 2, "Malacodermata," by the Rev. Henry Stephen Gorham, F.Z.S., &c. (1880-86.) Vol. V. "Longicornia," by Henry Walter Bates, F.R.S. "Bruchides," by David Sharp, M.B. (London: R. H. Porter, 1879-86.)

TWO more instalments of the entomological portion of this great work show how earnestly it is being pushed on; and if it can be completed on the same lavish scale of illustration, and with the same thoroughness of execution, it will afford materials for a true conception of the richness of insect life in the tropical regions far beyond anything that has been hitherto attempted. Not only will it be superior to any other work of a similar character, but it will probably surpass in magnitude all the other works dealing with tropical insect-faunas combined.

The plan and method of treatment being exactly the same as that of Mr. Bates's volume on the Cicindelidæ and Carabidæ, already reviewed in NATURE (vol. xxxiii. p. 77), it will only be needful here to make a few remarks on points of general interest. Taking first the Malacodermata—a group represented in Britain by our Telephori, "soldiers and sailors," our glow-worm, and other allied forms—Mr. Gorham informs us that nearly one-fourth of all the known species of the world are here described from Central America, a preponderance in this district which is due no doubt to the fact that the group has never been a favourite one among coleopterists, and has thus been comparatively little attended to by collectors in the tropics. The large number of 813 species here enumerated as against 1272 of the favourite Longicornes, shows that it is not impossible that this tribe may one day rank among the richest groups of beetles. From a comparison of certain of the best known families in different parts of the world Mr. Gorham is of opinion that the total number of species in the tribe is not less than 12,000. He also states that the tropical American forms are as a whole very distinct from those of Africa and the Eastern tropics, and that they rank as "persistent forms of an earlier stage of development." This is specially interesting, because it agrees so well with the fact that nowhere else in the world do low forms of mammalia and birds constitute so large a proportion of a wonderfully rich fauna as in tropical America. Another suggestive remark is, that whenever "a genus is common to Central or South America and other distant parts of the world, it is also the case that it is represented by a species also identical or nearly so in both districts." Many examples are given of this interesting fact, and the no doubt correct solution is suggested, that in these cases there must have been a comparatively recent transmissal, either from one country to another, or from some common centre to both. The Miocene beetles of Switzerland exhibit so close a resemblance to living forms that we may well suppose these identical species to have been common to Europe and North America in Miocene times, and to have passed southward to the Old and New World tropics respectively when the temperate zones became unsuitable to them.

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Of Longicornia about 9000 species are known, so that those from Central America alone are nearly one-seventh of the whole; but in this tribe more perhaps than any other is our knowledge imperfect, owing to the bulk of the species being restricted to the virgin forests, where they are very local and marvellously specialised; while though exceedingly abundant under favourable conditions—that is, when extensive clearances in the forest have been *recently* made—yet at other times they are so scarce that it is impossible to obtain even a moderate collection of them.

Mr. Bates remarks on the wonderful "endemism" of the tropical American Longicorn fauna, 304 genera out of 330 being exclusively American; while both he and Mr. Gorham insist on the whole of the Central American fauna, including that of the highlands of Mexico, having tropical rather than north-temperate affinities. As regards the Malacodermata, however, the northern parts of Mexico are said to be "totally unexplored," while Mr. Bates states that there are 30 northern generic forms which reach Mexico but rarely go further south.

The Bruchides form a small tribe of usually minute beetles which have been so imperfectly collected in the tropics that no comparisons of any value can be made. No less than 150 species are here enumerated, forming nearly one-fourth of all that are yet known, and nearly 120 of these are new species, 25 of which are figured.

On looking over the beautifully executed coloured plates, on which nearly 500 new species of Longicornes are figured, we are struck by the great preponderance of protective tints in these insects, whole plates being filled with species of delicately mottled brown or grey colours evidently harmonising with the varying hues and rugosities of the tree trunks on which they rest; while those of more elegant forms and brilliant tints are usually of smaller size, except when they gain protection by their resemblance to other inedible insects. It fortunately happens that the other group treated in these volumes—the Malacodermata—are very largely, if not wholly, such a protected group, it having been found by experiment that birds will not eat our gay-coloured Telephori, and Mr. Belt found the same to be the case with the fire-flies of Nicaragua and their allies. In all parts of the world these insects are mimicked by others which have no such protection, and it is interesting to compare the plates in these two volumes and to see how many of the Longicornes have taken on the form and colouring of the Malacodermes. Whenever I noticed a pair which undoubtedly resembled each other, I turned to the descriptions, and in every case found that they inhabited the very same locality. Thus the Longicorn *Otheotethus melanurus* imitates the Malacoderm *Lucidota discolor*, both found at Chontales, the species mimicked having however, as is usual, a wider range. *Tethlimmena aliena* and *Lygistopteris amabilis*, another mimicking pair, are both recorded from Chontales only. *Callia albicornis*, from Panama, resembles two species of Malacodermes, *Silis chalybeipennis* and *Colyphus signaticollis*, both from Panama, and both taken on the Volcano de Chiriqui. If these last two are both inedible, it is a case among the Coleoptera similar to the numerous interesting cases of protected genera of Heliconoid butterflies resembling

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each other, the theory of which has been so lucidly explained by Dr. Fritz Müller (see NATURE, vol. xxvi. p. 87, and vol. xxvii. p. 481). A genus of Longicornes has been named *Lycidola*, and its eight known species are all said to resemble species of *Lycus*. Besides these there are at least a score of Longicornes which are evidently mimickers, though the exact species imitated does not happen to be represented on the plates. There are also many of the smaller species which evidently mimic ants or wingless Mutillidæ. Three such species are named by Mr. Belt, and two of these are figured, but they do not appear to resemble ants half so much as at least a score of other species; showing how difficult it is to determine whether a species is protectively coloured by means of figures, however carefully drawn and coloured. The extensive collections on which these volumes are founded would, I feel sure, afford a mass of interesting cases of mimicry if search were made for them, since, besides those already mentioned, there seems to be a considerable number of Longicornes which resemble some of the Cleridæ figured among the Malacodermata, and these also are probably cases of mimicry, although I am not aware that the Cleridæ have been proved to be an uneatable group.

Looking at the copious series of figures here given there does not seem to be any superiority of colouring over the corresponding Eastern groups. The much larger proportion of Cerambycidæ to Lamiidæ in tropical America gives it an advantage over the Eastern tropics, because the former family comprises most of the elegant forms and gay colours of the tribe; but notwithstanding their inferiority in this respect the Longicornes of Penang, of Java, and of New Guinea appear to be quite equal in their development of colour to those of Central America.

The present work has been got up at so great an expense both of time, labour, and money to its originators, Messrs. Godman and Salvin, that it must be considered one of the noblest individual contributions to the study of natural history that has ever been made. Its great bulk and cost must, however, render it inaccessible to many students who would wish to possess it, while its value to them would have been considerably increased if descriptions of all the recorded species had been given as well as of those which are new, rendering it a complete book of reference to the Insecta of Central America.

I would therefore suggest to Messrs. Godman and Salvin that they would confer a still greater boon on entomological students if they could make arrangements for the preparation of a series of compact octavo volumes giving the letterpress only of the present work, together with either the original descriptions or sufficient diagnoses of all the species enumerated which are not here described. These volumes could be issued after the completion of the great work, all brought up to one uniform date; and if published at a moderate price they would be sure to command a very large sale. Complete faunal hand-books of the kind suggested are among the most generally useful works that can be published, because they obviate the enormous waste of time and labour involved in consulting scores of expensive volumes in order to determine the name and history of perhaps half the insects which a student may possess.

It is quite unsafe to venture on any detailed criticism

of the work of one so thoroughly acquainted with Longicorn Coleoptera as Mr. Bates, but my attention was attracted to Table II. by the figures of two alleged female Prionidæ, which are represented of a rich green colour, while the respective males are bronzy olive. If this is the fact, it is a curious case of reversed sexual coloration, though by no means unprecedented. In one of these species, *Mallaspi belti*, however, two varieties are figured, one green, the other olive brown, both said to be females; but the green specimen (as figured) differs greatly from the brown specimen, in having the femora of the second pair of legs much longer and more slender, in the somewhat different dentation of the thorax, and especially in the very different form of the scutellum, important differences which seem inconsistent with identity of species. Should any error have crept into the plates, the author will no doubt be glad to have his attention called to it.

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### GEOMETRICAL OPTICS

*An Elementary Treatise on Geometrical Optics.* By W. Steadman Aldis, M.A. (London: Deighton, Bell, and Co., 1886.)

THIS is a second edition of a work which appeared first in 1872, and which was designed to meet the requirements of students reading for the first three days of the Mathematical Tripos. The new edition does not differ greatly from the old, except in form. The type is larger and clearer, and in this respect the book is considerably improved.

The laws of reflection and refraction, and the reflection and refraction of direct pencils at plane and spherical surfaces, are treated in a clear and comprehensive manner. In Article 36 reference is made to a useful method of illustrating from co-ordinate geometry the relations between a point and its image. If  $\phi$ ,  $\phi'$  be the principal focal lengths of an optical system,  $u$  and  $u'$  the distances of an object and its image from the principal points, we have  $\frac{\phi}{u} + \frac{\phi'}{u'} = 1$ . Thus taking rectangular axes, and measuring along them distances  $\phi$  and  $\phi'$ , we see that  $u$  and  $u'$  are the intercepts on the axes made by a straight line passing through the point  $\phi$ ,  $\phi'$ . This has been worked out in an interesting paper in the *Philosophical Magazine* for December 1884, by Prof. J. Loudon, of Toronto.

The next chapter deals with the oblique reflection and refraction of small pencils. The general explanation is extremely lucid, but it surely is a mistake not to have introduced the notation of the differential calculus. Of course this is excluded from the first three days of the Tripos, but so too are oblique reflection and refraction, and the work is rendered unnecessarily cumbersome by the omission. A similar remark may apply to some of the sections of the next chapter on refraction through prisms and plates.

Chapter VI. treats of lenses, which are dealt with in the ordinary manner. This part of the book would have been improved by the introduction of some of the geometrical results in which the main consequences of Gauss's work have been expressed by various writers. It is really a misfortune that the theory of principal and nodal points is so little known to English authors. It is