

suddenly, elevates its head, and remains motionless in a listening attitude; after pausing thus for a few seconds, it again runs to about the same distance as before, again stops to listen, and so on. These successive excursions are usually made in the same direction; but every now and then, during the process of listening, the thrush apparently hears a sound proceeding from some point within the circle which it has last entered; immediately the course of progression is deflected at an angle from the continuous straight line in which all the previous excursions were made, and, either with a single rush or after one or two brief pauses to make quite sure of the exact spot, the bird may nearly always be seen to find a worm.

I may take this opportunity of thanking your various correspondents for the information which they have supplied with regard to the towering of birds. Some of the letters mention ducks, teals, and widgeons as birds which occasionally tower. May I ask the writers of these letters whether the action in these cases resembled that of *true* towering in the case of partridges and grouse? I ask this because one of the numerous letters by which my communication to NATURE has been answered in the *Field*, states that birds of this build never tower; and on this supposed fact the writer constructs a theory as to the mechanism of towering in general. All the correspondence taken together cannot leave any doubt that there are at least *two* kinds of towering:—viz. (1) The common kind which I described, and the cause of which is certainly pulmonary hæmorrhage; and (2) a very rare kind which I have never myself witnessed, and the immediate cause of which appears to be cerebral injury. In the case of the second, or rare kind of towering, all the correspondents are agreed that the bird is not dead when found, and that it may even fly away again when disturbed. Never having had an opportunity of observing such a case, of course any hypothesis by which I may try to explain the cause of the rare kind of towering is of no further value than a conjecture; but I may remark that both kinds of towering may possibly be due to the same cause, if the parts of the brain which are injured when the second kind of towering ensues, are the parts whose injury Brown-Sequard found to be attended in the case of mammals, with bleeding of the lungs. At any rate, it would be worth while for any sportsman who may have the opportunity, to dissect a bird which he has seen to exhibit the second kind of towering, in order to ascertain whether, in such cases also, some degree of pulmonary hæmorrhage may not have taken place.

GEORGE J. ROMANES

IN Mr. G. J. Romanes' interesting remarks (NATURE, vol. xv., p. 177) on the sense of hearing in insects, he says:—"In the case of moths, however, I believe that sounds are never emitted, except of course the Death's-head."

As I trust that insects will continue to have a place in his observations, may I be allowed to call Mr. Romanes' attention to the following species of Lepidoptera which are known to produce sounds:—

1. *Vanessa*, several species.—The sound produced—which has been compared to the friction of sand-paper—has been noticed by several observers, viz., Rev. J. Greene (*Proc. Ent. Soc. of London*, New Series, ii., p. xcvi.), Mr. Hewitson (*l.c.* iv., p. ii.), and Mr. A. H. Swinton (*Entomologists' Monthly Magazine*, xiii., p. 169, January, 1877), who describes the apparatus by which the noise is produced. On the under surface of the upper wing one of the nervures is roughened like a file, and upon this a raised nervure on the upper surface of the underwing plays; there is also a circular embossed patch of the wing-membrane destitute of scales, which Mr. Swinton thinks serves to "impress the musical tremours." The object of this stridulation, Mr. Swinton suggests, may be classed with those phenomena of rivalry and love so conspicuous in the *Orthoptera*, &c., but at the same time it is produced when the insects are disturbed, and possibly also when the sexes are coquetting in mid-air. Moreover, the development of the mechanism is greatest in the female, contrary to the usual rule. For my own part, I incline to think that the object of the sound is rather the intimidation of possible enemies than a sexual love-call. Both Mr. Greene's and Mr. Hewitson's cases occurred when insects that were hibernating were disturbed, and the sound was renewed whenever the disturbance was repeated. These butterflies hibernate in dark holes and corners, and the sound may be intended to suggest to the disturber the hiss of a snake or the note of an angry wasp or bee. As the perpetuation of the species depends for the most part on the female, she is provided with a stronger

apparatus. If the sound is produced when the sexes are coquetting, it may be the butterfly expression of a playful "Get along with you."

2. The well-known case of *Acherontia* (the "Death's-head Moth").—The sound here also is probably for intimidation, and not a love-call. I cannot at present call to mind any observations on any disparity of the sound in the sexes.

3. *Setina*, several species, and

4. *Chelonia pudica*.

The sound emitted by these insects—which is compared to the ticking of a watch—is described by M. A. Guenée (*Ann. Soc. Ent. Fr.*, 4^e ser., vol. iv. 1864; translated in *Ent. Month. Mag.*, i. 223) who says that it is produced by two tympaniform vesicles situated in the pectoral region, and is much more developed in the male than in the female. This, M. Guenée remarks, is rather curious, for, as the females of *Setina* can scarcely fly, it would seem that, if the organ of sound is to produce a love call, it is the female, and not the male that should have it most strongly developed. M. Guenée consequently expresses himself unable to give any plausible reason to account for the object of the sound.

A reason has occurred to me and I here give it for what it may be worth. We know that the females of several Lepidoptera (especially wingless females) have the power of emitting a scent which attracts the males, often from considerable distances. When the male of *Setina* is hunting for the female and making probably his drums vibrate loudly, the sound reaching the concealed female may excite her to give out an increased odour, and thereby more surely attract the male. In short the drums are organs of excitation.

5. *Hylophila prasinivitta*.—This species Mr. Swinton (*Entom. Monthly Mag.*, vii. 231) has noticed to emit a twittering sound, which he thinks is produced by a structure between the thorax and abdomen.

I have been fortunate enough to have also had an opportunity of hearing the sound produced by this species (*Scottish Naturalist*, i. 213). The sound resembles a continuous squeaking and was heard on more than one occasion, and was audible at a distance of ten feet or upwards. All the specimens that I caught in the act of squeaking were males, so that I cannot say whether the other sex squeaks or not. The sound is emitted whilst the insect flies about the bushes, and the object of it is probably the same as I have suggested above in the case of *Setina*. The emission of the sound is quite voluntary on the part of the moth, as specimens taken in the act of squeaking and made to fly afterwards did not then give out any sound. Careful dissection revealed no structure that appeared capable of producing the noise except a tympaniform plate situated at the base of the hind body.

6. *H. quercana*.—According to Mr. Swinton (*l.c.* viii. 70) this species can make a "membranous sound," which he thinks is produced by the wing catching a little horny lateral thoracic plate.

There may be other recorded instances of sound-producing Lepidoptera, but I cannot at present recall any to mind. It is probable moreover that more species than are generally supposed emit some kind of a sound. It is therefore much to be regretted that the many collectors of Lepidoptera—whose sole aim seems to be the amassing of large collections and whose lack of anything beyond the mere desire to accumulate specimens, has made entomology a bye-word amongst the sciences—would not spend some of their misplaced energy in really studying the objects of their attention.

Mr. Romanes' observation of the sensible appreciation moths have for high-pitched notes suggests a question. Does the shrill squeaking of bats convey an intimation to moths of the approach of one of their greatest enemies?

It is to be noted moreover that in the majority of cases the sounds emitted by moths, and indeed all insects, themselves, are high pitched.

F. BUCHANAN WHITE

Perth, January 12

P.S.—Since the above was written I see that my friend Mr. McLachlan has pointed out (NATURE, vol. xv. p. 254) another record of a sound-producing moth—*Euprepia matronula*.

THE perusal of Mr. McLachlan's letter on "Sense of Hearing &c., in Birds and Insects" has recalled to my memory another instance of a Lepidopterous insect which possesses the property of emitting a marked sound when on the wing. This is a common Brazilian butterfly (*Ageronia feronia*), and attention