

men. The venation also differs, the veins forming the outer portion of the submarginal cell are less sinuous, the anterior branch of the third vein reaching the margin at the tip of the wing and not before the tip. The fifth vein forming the posterior margin of the discal cell is also less curved. The brown extends slightly further into the first and fourth posterior cells giving the margin a trilobed appearance.

Villa bigradata (Loew).

Anthrax bigradata Loew, Cent., viii, 37, 1869.

A specimen from Muskeget Island, Mass., June 18, 1913, collected by Dr. G. M. Allen, and a specimen from Provincetown, Mass., June 13 (Webber), can only be referred to this West Indian species. Coquillett records it from California. This distribution is interesting, though not unusual as several members of this family have a similar or much wider distribution.

SYNCHRONOUS MOVEMENTS IN *VANESSA ANTIOPA*
LARVÆ, WITH NOTES ON THE ATTRACTION OF
CERTAIN MALE LEPIDOPTERA BY THE FEMALES
OF THEIR OWN SPECIES.

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About the middle of last April, while taking my regular Sunday morning walk along a favorite woodland path, I saw a *Vanessa antiopa* depositing her eggs on a willow sapling. I broke off the twig with the eggs attached, carried them home and placed them in a breeding cage. The larvæ appeared in 17 to 18 days, went through the regular course of feeding and moulting and the latter part of May developed into a fine brood of over one hundred full-grown caterpillars. One evening a few days before pupation began, the cages (the colony had been divided and now occupied two cages) were brought out to the light for the purpose of putting in fresh food for the occupants, one cage being set on top of the other. The cages were partially filled with small willow branches, and the caterpillars were scattered all over the cages, some on the top and sides and others on the leaves and branches.

After they had been in the light a few minutes, I noticed that each and every caterpillar was moving its head up and down with a sort of a twitching motion, in perfect synchronism. These movements occurred at intervals of about two seconds and continued for about five minutes after they were first noted; I cannot say that I saw the beginning of this performance, but all the caterpillars in both cages were moving their heads vigorously when first noted, and at the end the movements stopped gradually until all were at rest. The following night I prepared to resume my observations, this time placing the cages about ten feet apart, but on this occasion during an hour's vigil no movement took place and the second day afterward pupation began.

Professor Edward S. Morse of Salem and others have observed and recorded the synchronous flashing of thousands of fireflies¹ which would not seem to be simply accidental considering the large numbers involved. In conversation with Mr. A. P. Morse of Wellesley, he said that if his recollection was correct, he had seen when, a boy synchronous movements in a colonial black and yellow larva on oak, probably a species of *Anisota*; also in *Datana* (probably *ministra*) on black walnut; and in a green and black sawfly larva on gray birch.

In my observations on the *Vanessa antiopa* larvæ the movements doubtless signified alarm and were possibly protective, but why the alarm shown but once after several weeks of the same routine and then the perfect synchronism in both cages? By a process of elimination in regard to the known sensory equipment of insects, I get no satisfactory results; a floor of wood and tin precludes the use of sight organs, not the least sound could be detected and the slender legs of the upper cage were the only material path excepting the air through which vibrations could be transmitted.

The theory of vibratory communication would seem the most probable, and if it were known that insects could transmit as well as receive vibratory impressions, it would explain many things. Folsom says of insects:

“They have many curious integumentary organs which from their structure and nerve connections are probably sensory end organs, though their functions are either doubtful or unknown. Such an organ is the sensillum placodeum—function doubtful;

¹ *Science*, July 26, 1918, pp. 92-93.

not auditory and probably not olfactory, though the function is doubtless a mechanical one.”

Before passing from mechanical considerations, it should be noted that the telephone receiver and transmitter are practically of the same construction, and while rejecting any electrical influence, if insects are equipped with means for receiving vibrations, it may also be possible for them to transmit them.

In the matter of the attraction of the males of certain species of moths by the females at apparently long distances, Fabre notes that the male moths came with the wind at one time, and that the reflux of scented atoms in a direction contrary to the aerial current seems inadmissible.

I have tried the experiment of fastening a female *turnus* butterfly to a twig with varying results. On one occasion during the summer of 1917 I captured what appeared to be a freshly emerged specimen of this species and even before the act of securing it to a leaf was completed, the males began to arrive and I took about twenty specimens in a short time. They came from many directions, sometimes varying greatly from a direct line but always reaching the goal. If I remember correctly a light air was stirring, the butterflies coming with the wind as well as against it. The sense of smell was doubtless the controlling factor for a limited distance, as however erratic the flight at a distance the course was direct in the last few rods.

Smell concerns matter and it is difficult to conceive of the divisibility of matter to such an extent as to fill the air with scent atoms unperceived by the human sense of smell particularly against the wind or in the absence of perceptible air currents except for limited distances. Fabre¹ endeavored to mask or stifle any possible effluvia emanating from his female moths by surrounding them with various noxious odors but apparently without the slightest effect, the males arriving in undiminished numbers and without hesitation.

In strict justice to the case of *Sympathetic Vibratory Communication* vs. *The Sense of Smell*, I shall have to testify for the defendant in so far as to say that a female dog belonging to a neighbor at certain times seemed to attract the males from all directions regardless of air currents; and her only known external vibratory organ had been amputated in infancy.

¹Life of the Caterpillar, pp. 275, 276.

Postscript. Since writing the above paper, Mr. A. P. Morse has called my attention to an article in the American Museum Journal of February, 1918, p. 145, by Mr. W. L. McAtee who quotes Mr. E. A. Goldman of the U. S. Biological Survey mentioning a curious instance of synchronal insect movements: "When looking among the tree tops for birds, he has been taken unawares by an army of these (driver) ants. The soldiers of the driver ants have tremendously developed heads and jaws; their bite brings blood and they hang on till the heads are pulled off. The most interesting feature of their attack is the remarkable unanimity with which they set their teeth (?) into the skin. Whether they accomplish this by mental telepathy or otherwise, the fact remains that several ants scattered here and there over one's anatomy all decide to bite at one particular moment."

It may be that the action of the pulse was the stimulating influence that caused the ants to bite Mr. McAtee all at the same moment. Prof. W. M. Wheeler writes me: "There is doubt in my mind about McAtee's interpretation of the simultaneous biting of the soldiers of the driver ants. It may be merely a simultaneous response to the movement of the body of the person covered with ants. Such a movement of the skin would act as a stimulus and cause all the irritated ants to use their mandibles at the same moment. I have a feeling that I have noticed something of the kind in the tropics in other ants."

NEW RECORDS OF ORTHOPTERA IN NEW ENGLAND.

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Parcoblatta lata Brunner. This common native wood-roach of more southern range (formerly placed in genus *Ischnoptera*) has been taken in New England in a single instance. It was captured by me on July 13 on the ground floor of a dwelling-house at Wellesley, Mass., and identified and recorded by Hebard, who regards it as adventive in New England.

Manomera blatchleyi Caudell. An adult female of this walking-stick was taken by me at Greenwich, Conn., August 25, 1892, and



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